

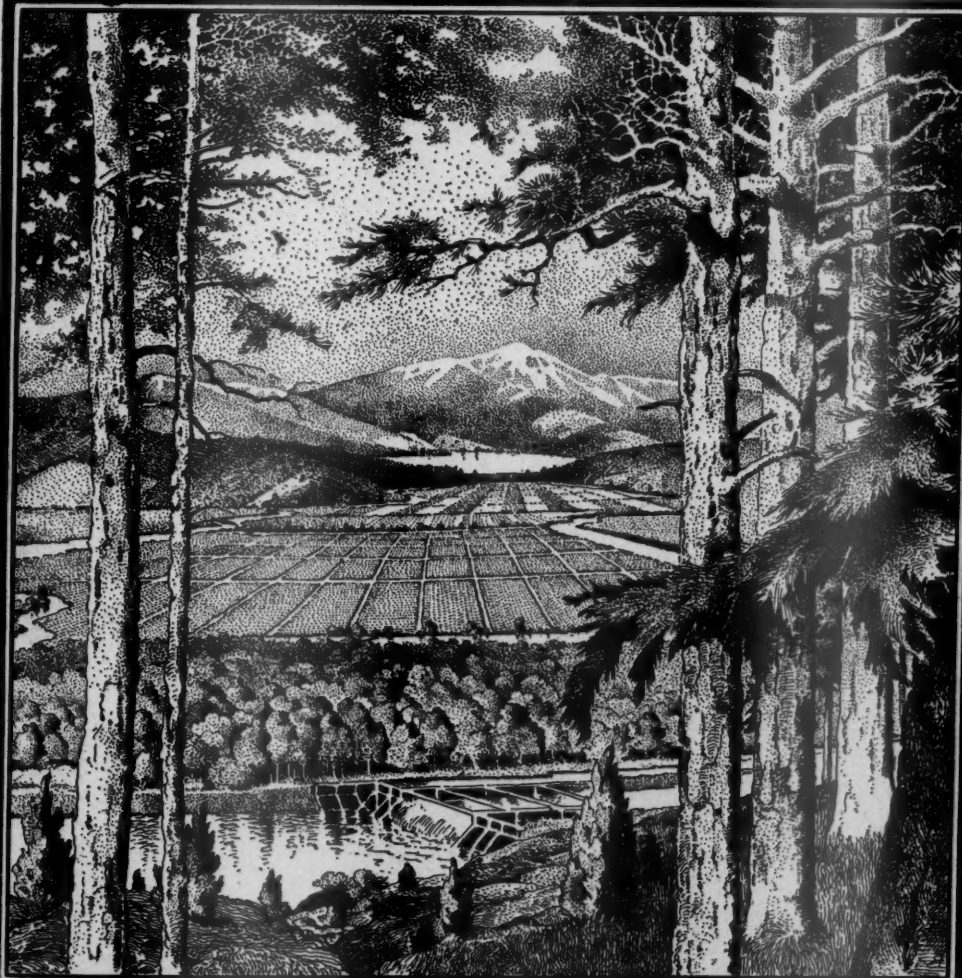
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**Vol. VIII—No. 12**

**DECEMBER, 1902**

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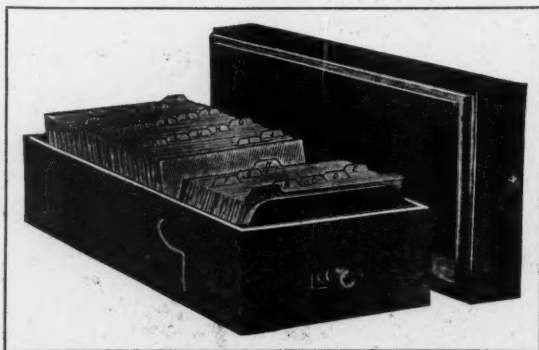
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4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
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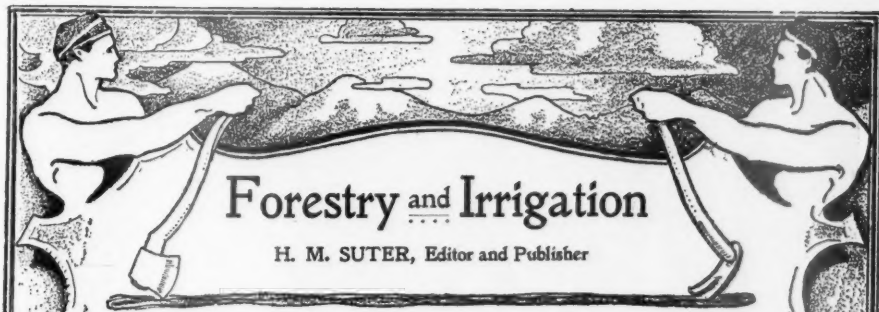
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# Forestry and Irrigation

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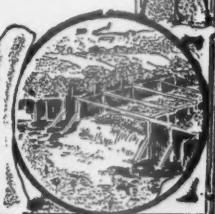
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ATLANTIC BUILDING

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VIEW IN INTERIOR OF EUCALYPT GROVE (P. 511)

# Forestry and Irrigation.

VOL. VIII.

DECEMBER, 1902.

NO. 12.

## NEWS AND NOTES.

### **Meeting of American Forestry Association.**

The annual meeting of the American Forestry Association was held at the Atlantic Building, Washington, D. C., at 10 o'clock a. m., on December 10. The meeting was called to order by Mr. F. H. Newell, and the minutes of the previous meeting were read by Mr. Geo. P. Whittlesy, Recording Secretary. The meeting was then adjourned, to meet at the same place on December 31, at 10 o'clock a. m.

The object of postponing all business until December 31 was to enable the many members who wish to attend the meeting of the American Association for the Advancement of Science, December 29 to January 3, to be present at both meetings.

### **An Important Meeting.**

The fifty-second annual meeting of the American Association for the Advancement of Science and first of the "Convocation Week" meetings will be held in Washington, D. C., December 27, 1902, to January 3, 1903. A meeting of the executive committee of the council (consisting of the general secretary, secretary of the council, the permanent secretary, and the secretaries of all the sections) will be held in the council-room of the Cosmos Club at noon on Saturday, December 27. The permanent secretary has been notified that the following societies will meet in affiliation with the Association at the Washington meeting:

The American Anthropological Association, American Chemical Society, American Folk-lore Society, American Microscopical Society, American Mor-

phological Society, American Philosophical Association, American Physical Society, American Physiological Society, American Psychological Association, American Society of Naturalists, Association of American Anatomists, Association of Economic Entomologists, Astronomical and Astrophysical Society of America, Botanical Society of America, Botanists of the Central and Western States, Geological Society of America, The National Geographic Society, Naturalists of the Central States, Society of American Bacteriologists, Society for Plant Morphology and Physiology, Society for the Promotion of Agricultural Science, and Zoölogists of the Central and Western States.

The officers of the local committee for the Washington meeting are: Charles D. Walcott, president; G. K. Gilbert, vice-president; Marcus Benjamin, secretary; executive committee, Marcus Benjamin, David T. Day, G. K. Gilbert, Gilbert H. Grosvenor, L. O. Howard, George M. Kober, W J McGee, C. E. Munroe, and Charles D. Walcott.

### **Iowa Park and Forestry Association.**

The second annual meeting of the Iowa Park and Forestry Association was held at Des Moines, December 8 and 9, 1902. Much enthusiasm was manifested at the sessions and the papers read were interesting and dealt particularly with the practical aspects of parking and forests from the æsthetic and economic standpoints. The papers and their authors were as follows: "Dendro-Chemistry," Dr. J. B. Weems, Iowa State College, Ames; "Our Wild Plants for Parks and Gardens," Wesley Greene, Iowa

State Horticultural Society; "Government Forest Planting in the Sandhills of Nebraska," J. C. Blumer, Halsey, Nebr.; "The Farmer's Woodlot," E. R. Hodson, Washington, D. C.; "Civic Improvement for Small Cities," De La Sheldon; "Notes on Evergreens," Prof. A. T. Erwin, Ames; "Beautifying and Utilizing Railroad Grounds," E. E. Little, Ames; "City Parks," J. T. D. Fulmer, Des Moines; "Elms and Other Shade Trees," A. Duebendorfer, Ames; "Street Trees and Parking," W. A. Burnap, Clear Lake; "Trees," Cyrus A. Mosier, Des Moines; "Iowa Oaks," Prof. B. Shimek, Iowa City; "Some Diseases of Forest Trees in Iowa," G. M. Lummis; "Progress of Forestry and the Work of the Bureau of Forestry in Iowa," T. W. Mast, Washington, D. C.

The reports of the various officers and committees showed the Association to be in a flourishing condition. The Committee on Legislation was continued to frame a bill for the protection of forest and fruit trees, as the bill which was presented at the last session of the legislature was not satisfactory to all, and failed to pass at the last moment. Prof. T. H. MacBride, of Iowa City, was re-elected President of the Association. He presented a report on the "Present Status of Parks in Iowa," illustrated by lantern slides. Wesley Greene, of Des Moines, was elected Vice-President, and Prof. L. H. Pammel and Silas Wilson were re-elected respectively Secretary and Treasurer. The Executive Board consists of C. A. Mosier, of Des Moines; H. C. Price, of Ames, and J. S. Trigg, of Rockford.

### Disposal of Public Lands.

In his message to Congress President Roosevelt said: "So far as they are available for agriculture, and to whatever extent they may be reclaimed under the national irrigation law, the remaining public lands should be held rigidly for the home-builder, the settler who lives on his land, and for no one else. In their actual use the desert land law, the timber and stone law, and

the commutation clause of the homestead law have been so perverted from the intention with which they were enacted as to permit the acquisition of large areas of the public domain for other than actual settlers and the consequent prevention of settlement."

This reference in the President's message is but one expression of the growing demand throughout the entire country for greater conservatism in the disposal of the remaining public lands. The report of the Secretary of the Interior for the current year is a record of stupendous land frauds, whereby vast areas of fertile agricultural land have been put beyond the reach of settlers by those desiring to acquire large holdings or land for the grazing of live stock or for speculative purposes.

All of the laws referred to are apparently theoretically correct and their intention was apparently good. It seems impossible, however, to administer these laws in such a way as to prevent fraud. It has become the custom to receive these entries without question and to accept affidavits without investigation.

The demand for some check in these wholesale depredations has been rapidly growing in volume during the past two years, and has now culminated in a recommendation from the President that the matter be looked into as one of urgent importance.

Acting immediately upon this suggestion, Senator Quarles, of Wisconsin, and Representative S. L. Powers, of Massachusetts, have introduced a bill entitled "A bill to repeal the law providing for the sale of timber and stone lands, the desert land law, and the commutation clause of the homestead law." This bill was referred to the Public Lands Committees in Senate and House and consideration will be urged. It is believed that the committee in the Senate will undoubtedly make a favorable report upon this measure. Some difficulty is anticipated in the House committee, owing to a possible lack of understanding on the part of some of the members of the importance of the question involved and the sympathy of others with the extensive range interests of the sparsely settled states which

they represent. These measures will not be allowed to rest, however, until the battle is won or lost for the home-seekers.

The first section of the bill proposes to repeal the timber and stone law. Under this law over half a million acres of timber were disposed of by the government last year for \$2.50 an acre, and in a majority of cases one tree on each acre of this land would yield sufficient lumber to pay the cost of the entire acre of trees. The law provides that a citizen of the United States shall only be allowed to make one claim, and that one for his own personal benefit. This law has been evaded, and big lumber companies have hired people to exercise their citizenship rights, and they transfer these timber lands to the company employing them.

The second section of the bill proposes to repeal the desert-land law, a law which is correct in theory, but, as the President says, in its practical workings is now a detriment to the settlement of the western states. Vast areas of desert land have been taken up in Montana, Wyoming, Arizona, and many other places without any corresponding increase in population, showing that the concerns already in business are simply extending their holdings, and that these lands are not being purchased by *bona fide* incoming settlers.

**Forest Fires.** A number of forest fires have been reported during the past two months, most of them occurring in the middle west and particularly in the region of the Great Lakes.

**Michigan.**—Fires in this state and in Wisconsin were the most severe reported. In one case the same fire destroyed property on both sides of the Menominee River, which forms the boundary between the two states. The greater part of the damage was from Iron Mountain south. It is reported that the flames started from the clearing of lands by farmers, and the entire estimated loss, according to newspaper accounts, amounts to about \$80,000 in forest products and buildings. No esti-

mates have been received as to the damage to standing timber. Several bridges were burned, many farm buildings, and large quantities of cord-wood, including 9,000 cords belonging to the Niagara Paper Mill. At Middle Inlet the entire summer cut of cedar posts and poles was destroyed. The town of Kells was destroyed, and Fisher, Michigan, after sending to Marinette and Menominee for fire-engines, was spared by chance by the fire coming to the edge of town, burning a lumber yard, and then leaping clear of the village to burn on the other side. Opportune changes in the wind saved several other places. Later heavy rains fell throughout the region, effectually checking the flames.

**Wisconsin.**—In general, what has been stated of the Michigan fires is also true of those which extended into Wisconsin. At Mountain the loss in bark and logs was \$10,000. In all cases the fires were noted burning in an incipient stage, but little heed was paid to them so long as they did not threaten valuable property. In one case a party of campers noticed a smouldering fire of small proportions, but paid no attention to it until it eventually hemmed them in, and it was only after great hardship and almost superhuman efforts that they escaped.

**Pennsylvania.**—Late in October a fierce fire raged in the foothills of Chestnut Ridge, near Millwood, in Westmoreland county, started, it is supposed, by burning wads from hunters' guns. A general alarm was made, and the farmers of the neighborhood turned out in force to fight it by back-firing. The flames extended over several miles of territory, but were controlled after burning a few days. The greatest damage was to standing timber.

**California.**—Fires north of San Francisco Bay, in the neighborhoods of Santa Rosa and San Rafael, devastated over five hundred acres and destroyed several homes. Sparks from a night train are supposed to have started the fires, which were found burning fiercely, fanned by high winds, soon after the train had passed. Near Eureka, on the northern coast, several fires occurred, which did but little damage beyond destroying a few ranch buildings.



SKIDDING LOGS IN AN ADIRONDACK FOREST IN WINTER.



**Nebraska.**—A prairie fire raged on the Rose Bud Indian reservation from November 1-7. The loss amounted to thousands of dollars, hundreds of head of cattle were burned, and several ranchers are reported missing.

**Washington.**—A timber cruiser named Duval, who investigated the region in Clarke county recently burned over, discovered a small woodland lake entirely filled with the decaying carcasses of wild animals. The lake, about one acre in extent, situated in township 6 north, range 4 east, had almost its entire surface covered with the putrefying remains of deer, foxes, bear, wolves, and all sorts of smaller animals. It is estimated that many thousands of animals perished here of suffocation in their attempt to escape the flames.

**Kentucky.**—South of Paducah forest fires raged about the middle of November, and spread into western Tennessee. The fires occurred along the lines of the Illinois Central, and Nashville, Chattanooga & St. Louis railroads. Much damage to timber and fences is reported.

**Texas.**—A prairie fire near La Port was started by sparks from an engine. A subsequent train passing through the fire had the cotton on a flat car ignited. The entire train, with the exception of the engine and one car of cotton, was destroyed, the loss amounting to \$100,000.

**Ohio.**—Fires in the woods near Glenville burned over many acres and destroyed timber and fences. It was presumably started by the burning wads from hunters' guns. Three fires of this nature occurred in the locality within a week of November 15, following the opening of the hunting season.

**Montana.**—November 1 a forest fire was reported raging on the Flathead Indian reservation and, which it is reported, destroyed millions of feet of the finest timber in the state.

**Tennessee.**—Reports of forest fires near Lynnville and Rugby show that they lasted for several days about November 10, but that they were extinguished before a great deal of damage was done.

**South Dakota.**—Two men going through the woods near South Lead discovered a fierce forest fire, and im-

mediately hastened to the nearest points where aid could be secured. A number of persons turned out, and after several hours of hard fighting subdued the flames, which threatened a portion of the city.



### **Water Rights on Public Domain.**

In view of the present interest in irrigation and the appropriation of water in the arid region, certain parts of the decision of the United States Supreme Court in the case of the United States *v.* Rio Grande Irrigation Company will be of interest.

The court, speaking of the common-law rule of riparian rights and the system of appropriation of water, which has grown up in the western country, makes the following statements as to the respective rights of control exercised by Congress and by the states:

"Although this power of changing the common law rule as to streams within its dominion undoubtedly belongs to each state, yet two limitations must be recognized: First, that in the absence of specific authority from Congress a state cannot by its legislation destroy the right of the United States, as the owner of lands bordering on a stream, to the continued flow of its waters; so far at least as may be necessary for the beneficial uses of the government property. Second, that it is limited by the superior power of the general government to secure the uninterrupted navigability of all navigable streams within the limits of the United States. In other words, the jurisdiction of the general government over interstate commerce and its natural highways vests in that government the right to take all needed measures to preserve the navigability of the navigable water courses of the country even against any state action. It is true there have been frequent decisions recognizing the power of the state, in the absence of Congressional legislation, to assume control of even navigable waters within its limits to the extent of creating dams, booms, bridges, and other matters which operate as obstructions to navigability. The power of the state to thus legislate

for the interests of its own citizens is conceded, and until in some way Congress asserts its superior power, and the necessity of preserving the general interests of the people of all the states, it is assumed that state action, although involving temporarily an obstruction to the free navigability of a stream, is not subject to challenge." (174 U. S., 703.)

**California  
Water and  
Forest  
Association.**

The fourth annual convention of the California Water and Forest Association was held at San Francisco, December 5 and 6. The first day's session was given up to the adoption of a series of resolutions. These ask Congress to appropriate \$75,000 for the irrigation investigations carried on by the Department of Agriculture; pledge the support of the Association to the California Club's bill for the establishment of a school of forestry in the State University; ask the Secretary of the Interior to have definite determination made of the lands under the proposed storage reservoir in Clear Lake, Lake county, to reclaim the arid lands, and also request him to inform the association what lines to proceed upon that the district may organize to enjoy the benefits of the law for the reclamation of arid land.

A resolution was also adopted to have a committee appointed to lay before the government the facts concerning forestry in its relation to agriculture in the northern part of California, and impress the need of the preservation of forest areas, especially on the eastern slope of the Coast Range. It was resolved further that a withdrawal of the forested lands of the state from private entry would accomplish the objects in view without the objections which are being urged to withdrawal by means of the Forest Reservation act.

The Association thanked the California Federation of Women's Clubs for work in coöperation with the Association, and commended the efforts of the California Club toward the preservation of the Calaveras Big Trees.

The second day's sessions were devoted to the discussion of irrigation problems, most of the time being taken up with criticisms of an irrigation and forestry bill as a substitute for the one vetoed by Governor Gage at the last session of the legislature. This bill was framed by a committee of the Association, consisting of W. H. Beatty, Chief Justice of the Supreme Court; ex-Justice John D. Works, who will urge its passage at the next session of the legislature, as the Association's representative; President Wheeler and Prof. Frank Soule, of the University of California; President Jordan and Prof. C. D. Marx, of Stanford University; Elwood Mead, of the U. S. Department of Agriculture, and F. H. Newell, hydrographer of the U. S. Geological Survey. The bill is voluminous, and embraces eighty-five different sections, but its principal objects are as follows:

To declare the state's ownership of its flowing waters subject to vested rights; to define riparian rights and limit them to beneficial and needed uses of water; to provide means by which water may be appropriated; to fix rates and compensation for water supplied to the public; to abolish the offices of Commissioner of Public Works and the auditing board to the Commission of Public Works, and substitute a board of engineers, of which the governor shall be *ex officio* member, and to vest in the board of engineers thus provided all powers necessary to carry out the provisions of the act, to provide a system of administration and control of distribution of water, and to prevent illegal use and waste; to authorize the state to acquire any and all water and water rights, and to protect the federal government in the proposed storage of and distribution of flood waters.

Chief Justice Beatty was elected president; William Thomas was elected first vice-president; Arthur P. Briggs and J. B. Lippincott, respectively second and third vice-presidents; T. C. Friedlander, secretary, and F. W. Dohrmann, treasurer.

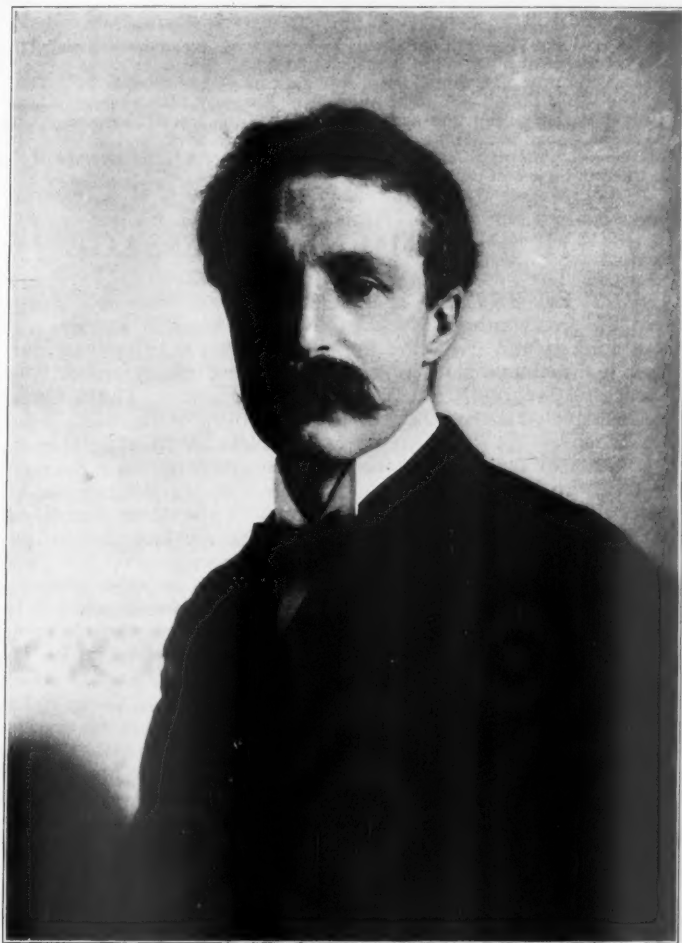


Photo by Frances Benjamin Johnson.

GIFFORD PINCHOT,

FORESTER, U. S. DEPARTMENT OF AGRICULTURE.

**G**IFFORD PINCHOT, the chief executive officer of the Government dealing directly with the forests of the United States, has recently made a trip of inspection in the Philippine Islands, and is now on his way back to Washington.

The great and rapidly increasing popular interest in the subject of forestry has resulted in the Bureau under his charge expanding to a notable degree, and has thrown upon Mr. Pinchot extraordinary responsibilities and conflicting duties. His presence is needed and urgently asked at widely scattered points, not only across this continent, but even in Alaska, the Hawaiian Islands, and the Philippines. There is everywhere a demand for information and advice regarding the best way in which the forests may be utilized; questions coming not merely from owners of great estates, but also from farmers having small woodlots, which serve them as one source of livelihood. It has not been an easy task to build up not merely the science of forestry in the United States, but at the same time educate and develop men competent to carry on the work, and the successful outcome has been largely dependent upon the enthusiasm and vigor at all times displayed by the Forester.

Mr. Pinchot was born at Simsbury, Conn., August 11, 1865, and was graduated from Yale University in 1889. His early interest in forestry led him to visit France, Germany, Switzerland, and Austria, where he studied in the forest schools of those countries. He began the first systematic forest work in the United States at Biltmore, N. C., in 1892. Later he was appointed

a member of the National Forestry Commission by President Cleveland, and assisted in outlining the boundaries of the great reserves proclaimed at that time. Mr. Pinchot has written a number of official reports and privately printed books, the most notable of these being "The Primer of Forestry," "The White Pine," and "The Adirondack Spruce." His executive duties as chief of the Bureau of Forestry keep him actively engaged in the forest, alternating with work at the Washington headquarters. His assistants are scattered in every part of the United States, and are rapidly developing plans and methods for conserving the forest reserves of the country and putting them to their best use.

## THE PRESIDENT'S MESSAGE.

PRESIDENT ROOSEVELT again showed his great interest in the questions of forestry and irrigation by giving them a prominent place in his recent message to Congress. The part of the message devoted to these subjects is reprinted here:

"Few subjects of more importance have been taken up by the Congress in recent years than the inauguration of the system of nationally aided irrigation for the arid regions of the far west. A good beginning therein has been made. Now that this policy of national irrigation has been adopted, the need of thorough and scientific forest protection will grow more rapidly than ever throughout the public-land states.

"Legislation should be provided for the protection of the game, and the wild creatures generally, on the forest reserves. The senseless slaughter of game, which can by judicious protection be permanently preserved on our national reserves for the people as a whole, should be stopped at once. It is, for instance, a serious count against our national good sense to permit the present practice of butchering off such a stately and beautiful creature as the elk for its antlers or tusks.

"So far as they are available for agriculture, and to whatever extent they may be reclaimed under the national irrigation law, the remaining public lands should be held rigidly for the home-builder, the settler who lives on his land, and for no one else. In their actual use the desert-land law, the timber and stone law, and the commutation clause of the homestead law have been so perverted from the intention with which they were enacted as to permit the acquisition of large areas of the public domain for other than actual settlers and the consequent prevention of settlement. Moreover, the approaching

exhaustion of the public ranges has of late led to much discussion as to the best manner of using these public lands in the west which are suitable chiefly only for grazing. The sound and steady development of the west depends upon the building up of homes therein. Much of our prosperity as a nation has been due to the operation of the homestead law. On the other hand, we should recognize the fact that in the grazing region the man who corresponds to the homesteader may be unable to settle permanently if only allowed to use the same amount of pasture land that his brother, the homesteader, is allowed to use of arable land. One hundred and sixty acres of fairly rich and well watered soil, or a much smaller amount of irrigated land, may keep a family in plenty, whereas no one could get a living from 160 acres of dry pasture land capable of supporting at the outside only one head of cattle to every ten acres. In the past great tracts of the public domain have been fenced in by persons having no title thereto, in direct defiance of the law forbidding the maintenance or construction of any such unlawful inclosure of public land. For various reasons there has been little interference with such inclosures in the past, but ample notice has now been given the trespassers, and all the resources at the command of the government will hereafter be used to put a stop to such trespassing.

"In view of the capital importance of these matters, I commend to the earnest consideration of the Congress, and if the Congress finds difficulty in dealing with them from lack of thorough knowledge of the subject, I recommend that provision be made for a commission of experts specially to investigate and report upon the complicated questions involved."

# THE NILE RESERVOIR DAM AT ASSUÂN

FORMALLY DEDICATED DECEMBER 8.—A NEW TYPE OF STRUCTURE WHICH MAY MARK AN EPOCH IN IRRIGATION ENGINEERING.—PHOTOS FURNISHED BY THE AUTHOR THROUGH COURTESY OF THE EGYPTIAN GOVERNMENT.

BY

THOMAS H. MEANS,

IN CHARGE OF UNITED STATES SOILS SURVEYS, DEPARTMENT OF AGRICULTURE.

EGYPT has probably been farmed for over 7,000 years. Until the present century practically all the farming done was by basin irrigation, which system consists in flooding large areas of land surrounded by dikes with water taken from the Nile River during time of flood. These basins vary in size from less than 5 acres to over 50,000 acres, and in a normal flood year are filled with water to an average depth of 4 feet for a period of about six weeks, after which the water is drained away and the seed sown in the newly deposited mud without cultivation. Such a system of irrigation is very wasteful of water and permits the growth of but one crop per year.

About 1820 Mohammed Ali, the reigning viceroy, started a movement which has almost revolutionized the agriculture of Egypt. He dug canals from the Nile, so that water could be had for irrigation throughout the year, permitting the growing of such crops as cotton, which would not mature under basin irrigation, and, what is more important, enabling two and sometimes three crops to be grown each year. Today, of the 6,250,000 acres of arable land in Egypt, less than 2,000,000 acres are watered by the ancient basin system.

While this change is more economical of water it necessitates a more uniform supply throughout the season. The Nile can always be depended upon to supply 8,000 cubic feet per second, but for the complete development of the modern or perennial system of irrigation at least 30,000 cubic feet per second are needed throughout the year. During flood season the Nile frequently dis-

charges from 300,000 to 500,000 cubic feet per second.

To conserve this flood supply for use during seasons of low water, a system of storage dams and regulators at various points on the Nile has been planned. As early as the time of Mohammed Ali this plan was under consideration, but it was not until Mr. W. Willcocks was appointed director general of reservoirs that the storage of water on the Nile was thoroughly considered.

In 1890 Mr. Willcocks presented a report on the subject to the Egyptian Government, in 1894 issued a second report, and in 1895 a final report, with plans and estimates. The central feature of this system of flood control provides for a dam across the Nile at the head of the first cataract, or five miles above the town of Assuân. In 1898, a short time after Mr. Willcocks had left the service of the Egyptian Government, contracts were signed by Sir John Aird & Co. for the construction within five years of the Assuân dam, upon the plans prepared by Mr. Willcocks. Sir Benjamin Baker acted as consulting engineer, and Mr. Maurice Fitzmorris was appointed resident engineer.

The dam as completed during the present summer conforms almost throughout to the plans of Mr. Willcocks. His original plans provided for the construction of a dam following the line of soundest rock across the stream, with 60 under sluices having an area of 21,500 square feet, or sufficient to carry off the maximum floods of the river. In the plan of 1894, 100 under sluices were provided, of the same capacity. In the final design there are 140 under sluices, each



23 x 6½ feet, and 40 at a higher level, 11½ x 6½ feet, giving a sluiceway of 24,000 square feet.

The question of the height of the dam involved a vexatious problem; the island of Philæ, which lies just above the cataract, contains some of the best-preserved temples and buildings of ancient Egypt. Mr. Willcocks' plan of a dam 100 feet above the zero of the Assuân gauge, with a capacity of 85,000,000,000 cubic feet of water, would submerge these temples to a depth of 26 feet for a portion of each year. In his book upon the dam, Mr. Willcocks says: "The International Commission held widely divergent views about Philæ temple. M. Boulé refused to have anything to do with a project which in any way deranged the temple. Signor Torricelli said that he had been asked his opinion about the dam, and about the dam he would give his opinion, regardless of temples and antiquities, which were outside his province. Sir Benjamin Baker proposed raising the whole temple, like a great Chicago hotel, clean above the high level of the reservoir. Savants and antiquaries, and many who were neither savants nor antiquaries, but to whom Philæ offered an easy opportunity of obtaining notoriety, all joined in the fray. Eventually, in a moment of great weakness, the Egyptian Government, buoyed up by a succession of good summers, accepted the lowering of the level of the reservoir, so that only a part of Philæ temple should be drowned. The new reservoir level was to be 26 feet below that hitherto proposed and the capacity of the reservoir was to be reduced from 85,000,000,000 to 35,000,000,000 cubic feet of water. Fortunately the conditions of stability laid down by the International Commission on the initiative of Signor Torricelli were so severe that I was able to design a dam nominally capable of holding up 35,000,000,000 cubic feet of water, but actually strong enough to hold up 70,000,000,000."

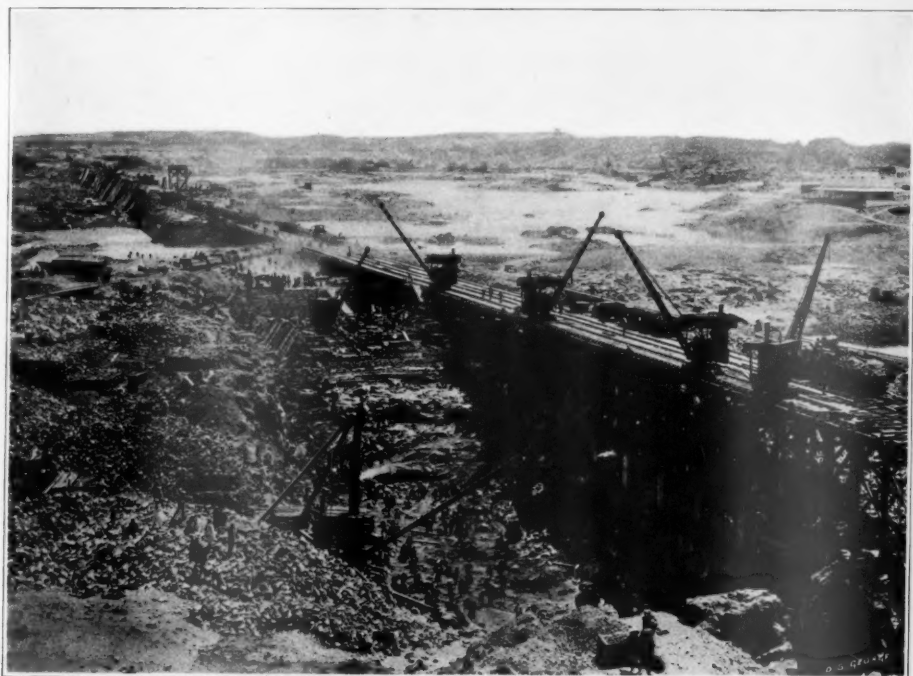
The dam is located five miles south of Assuân, or about 550 miles south of Cairo, at the head of the first cataract. At this point the Nile falls about 16 feet in four miles, the bed of the river

being granite rock. The fall is so slight that the cataract through most of the year is practically no more than rapids. The Nile boats go down the rapids and are towed up at nearly all stages of the river.

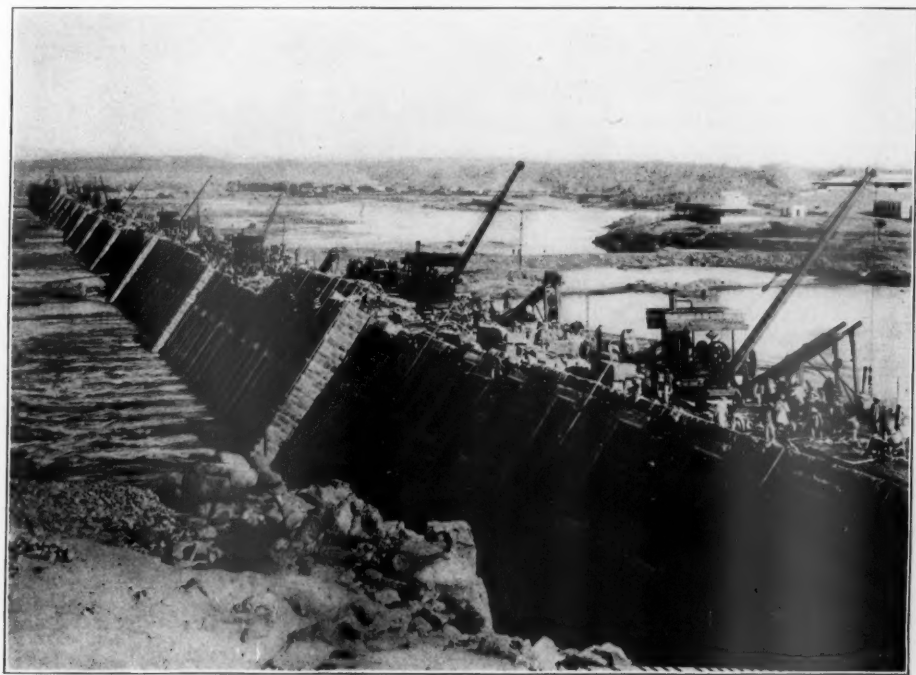
The dam is almost exactly one and a quarter miles long and has a maximum height above the foundation of 147 feet. The foundation was laid upon solid granite throughout. The rock was decomposed to a great depth; in some cases as much as 45 feet were removed before solid rock was found. This large amount of excavation increased the actual cost of the work beyond the original estimate. No drill-holes were made in the underlying rock before the work of construction was commenced, so that the information upon which the original estimate was made was not as complete as it might have been in this respect. The dam is 23 feet wide at the top and allows for a roadway 13 feet wide, on which is laid a narrow-gauge track. The rock is granite, quarried near by, and laid in Portland cement. It is said that 600,000 barrels of cement were used in this masonry — an order sufficiently large to materially affect the market value of cement in England. It is interesting to note that although the volume of masonry is very large, yet it approximates only one-fourth of the cubic contents of the Great Pyramid near Cairo.

The building of the dam was rendered especially difficult by the high floods which annually come down the Nile. The normal difference in level between high and low water at Assuân is 38 feet, and work could be carried on to advantage only during low water.

To expose a portion of the river bed, dikes were built, and the portion of the bed thus laid bare was excavated to solid rock. The foundation was then built up to about normal flood level, and a new portion of the bed dried. In this manner the foundation was completed across the river, and later the superstructure was added to the desired height. As will be seen by the accompanying illustrations, there was a great deal of hand labor, as many as 12,000 workmen being employed at one time,



THE ASSUAN DAM IN COURSE OF CONSTRUCTION: FILLING IN THE EXCAVATIONS WITH MASONRY.



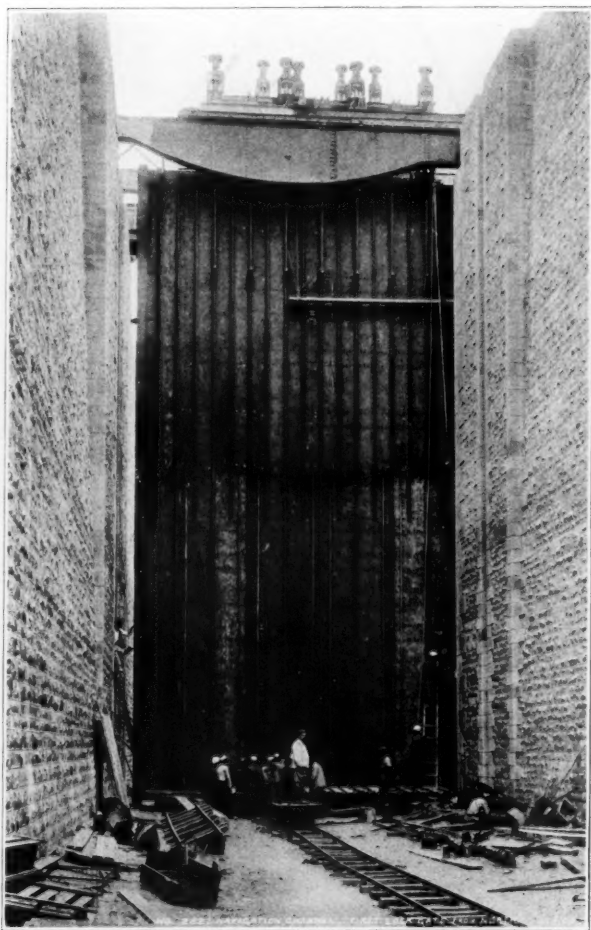
AT WORK ON THE SUPERSTRUCTURE, THE DAM NEARING COMPLETION.

about one-tenth of whom were skilled Italian masons.

The sluices are arranged in tiers at three levels. Iron gates of the Stoney system, running on rollers in steel grooves, permit the closing or opening of all the sluices in a very few moments, the gates being suspended on steel wire cable and falling by their own weight. The winches are operated by hand. A few of the sluices are lined with iron, but the greater number are lined with dressed granite blocks of large size.

Around the western end of the dam a ship canal 32 feet wide, with four locks, has been completed. This canal added very materially to the total cost of the dam. The gates in the canal are said to be constructed on plans drawn for lock gates on the proposed Nicaraguan canal.

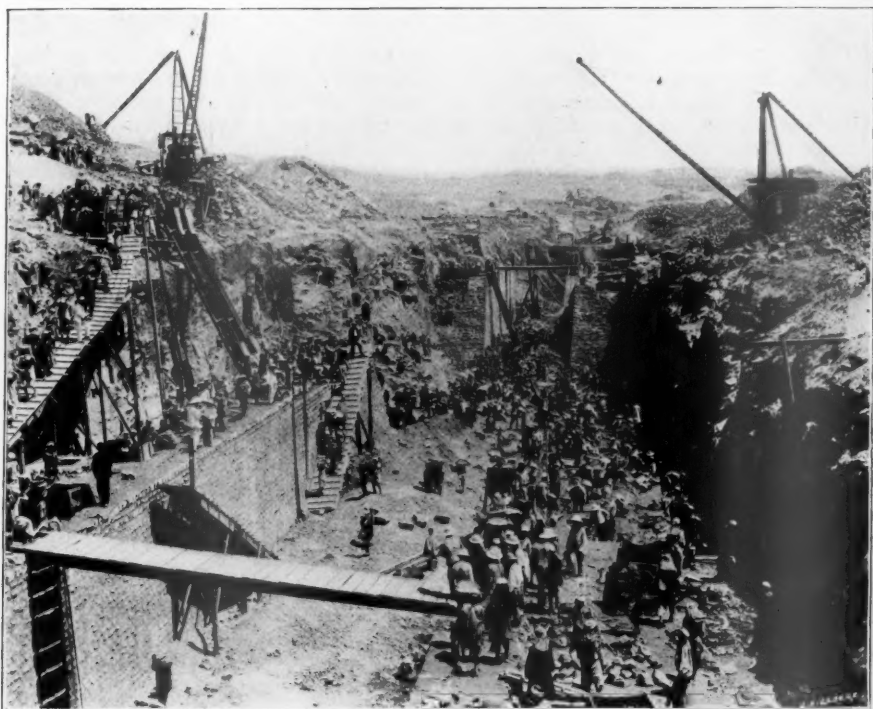
The sluice gates in the dam are opened during the first part of the flood season. In this time the muddiest part of the flood passes through the dam. As the river commences to fall—and fortunately the water carries much less sediment at that time—the gates are gradually lowered. As the flood subsides a portion of the water is thus held up, and when the season of low water arrives, with its consequent scarcity in the perennial canals lower down the river, the reservoir is full. Then the gates are slowly opened, and as the river continues to fall the reservoir supply is drawn upon and the flow down-stream from the dam maintained sufficiently to irrigate the desired acreage of land. The flow out



LOCK GATE ON THE SHIP CANAL AROUND THE DAM, BUILT FROM DESIGNS MADE FOR THE NICARAUGUAN CANAL.

of the dam is arranged so that the reservoir will be empty and the gates of the sluices open when the flood again comes down the river. There are no canals of large size taken from the river near the dam, so the water which is stored is turned into the river and taken out again further down the stream.

By this system of managing the gates in the sluices it is hoped to allow the greater part of the muddy water to go below the dam and to store the clearer waters of the later part of the flood.



BUILDING THE SHIP CANAL. THIS VIEW GIVES AN EXCELLENT IDEA OF THE VAST AMOUNT OF HAND LABOR.



THE SHIP CANAL, WHICH PROVIDES FOR NAVIGATION AROUND THE DAM.

These later waters are known to be much clearer and to carry a sediment which will remain in suspension for a long time; yet the problem of silt in this reservoir is a serious one, and the results which are obtained from this type of dam will be watched with interest by American irrigation experts.

The reservoir as now completed has a capacity of 800,000 acre feet, or, according to Mr. Willcocks, enough water to irrigate 600,000 acres of cotton and sugar cane. As has been stated, this water is not to be used for the extension of the irrigated area in Egypt, but is intended to be used in extending the area of perennially irrigated land at the

for the irrigation of desert land in the Sudan and Central Africa. Below Assuân a weir has already been built at Assiut and one is under construction at Zifta. These weirs are designed to raise the level of the Nile at low water to fill the irrigating canals already in operation or to be constructed. As a safety valve, to let the highest and destructive floods escape, a plan is under consideration to construct a canal to Wady Rayan, a depression in the Sahara to the west of the Nile Valley, and drain into it the excess of water which would otherwise damage Middle and Lower Egypt.

To again quote from Mr. Willcocks: "The Assuân dam is a work of a type



Photo by Thos. H. Means.

UPSTREAM SIDE OF DAM. THIS VIEW SHOWS THE MINIMUM HEIGHT OF WATER.

expense of the area under basin irrigation.

The cost of the dam cannot be stated accurately. The original estimate was \$8,750,000, but this sum was exceeded. The total cost to date is between the above sum and \$10,000,000, making the cost about \$12.50 per acre foot. The value of this water to Egypt is said to be \$100,000,000, or ten times the actual cost.

The Assuân dam is but one of a large number of engineering works planned for the complete subjugation and control of the Nile. It is hoped to build weirs and controlling works on the Nile at a number of points above Assuân for

the conservation of the flood waters and which is new in the world. If successful it will mark an epoch in dam-building. There must be sites on the torrential rivers of the arid and semi-arid regions of South Africa, Australia, and North America, where dams of the type of the one at Assuân will supply a want which has long been recognized.

"A reservoir dam, which will allow the earlier floods laden with deposits a free and unimpeded passage and which will afterwards captivate the comparatively clear waters of the terminal inundations and early percolations and store them for subsequent use, ought to put new life into many abandoned projects





WATER FLOWING THROUGH THE UPPER TIER OF SLUICES, DOWNSTREAM SIDE. (PHOTO  
REPRODUCED THROUGH COURTESY OF BUREAU OF SOILS,  
U. S. DEPARTMENT OF AGRICULTURE.)

for perennial irrigation. But the provision of perennial irrigation is not the only object for which this type of dam may be employed. Provided with its numerous flood openings, it may be looked upon as a weir capable of controlling the mightiest rivers in flood just as ordinary weirs control them in times of low supply; it may thus be utilized for the regulation of flood supplies of rivers and for their employment in basin or inundation irrigation. As designed for Assuân, its use is restricted to sites where broad platforms of sound rock

can be counted upon, but designed in 'bêton armée' or 'ribbed concrete.' I hope to see it utilized in narrow gorges and throttled valleys, where £20 will go as far as £50 in a broad platform."

Unfortunately, in America the characteristics of our rivers, their floods and the amount of sediment carried, are not as well known as they should be; but each year adds volumes to our knowledge of these streams, and by the time any extensive system is to be put in operation our knowledge will be much more complete.

## THE FUTURE OF OUR PUBLIC FOREST LANDS.

A SUGGESTION FOR THE CONSIDERATION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

BY

FILIBERT ROTH,

CHIEF OF DIVISION OF FOREST RESERVES, GENERAL LAND OFFICE.

**I**N an article which appeared in *FORESTRY AND IRRIGATION* for January, 1902, entitled "The Immediate Future in Forest Work," Mr. Gifford Pinchot, Chief of the Bureau of Forestry, U. S. Department of Agriculture, made the statement:

"Another of the essentials of the immediate future is the extension of the forest-reserve system. That may be said to be the first great need of forest work in this country at present."

Undoubtedly, it is the first great need of such work. The demand for the immediate withdrawal from further disposal of all forest lands, and for their proper treatment by the government, has become urgent from, practically, all quarters—if we except land-grabbers, lumber syndicates, and other speculative concerns engaged in colossal schemes of pillage and plunder on the public domain. National protection for our public forests is now the demand of the people; and when it can be said that the public demands forest protection, the time for action has arrived.

Thus far, the government can scarcely be said to have fairly entered upon a national forest policy. The work so far has been upon altogether too limited a scale to justify the term. Up to this time it has been confined to merely segregating tracts of land, here and there, in various sections of the country, while leaving the great mass of its forested lands to waste and destruction. Such a policy is far from sufficient. The Commissioner of the General Land Office pointed this out recently when he said:

"To set apart and protect a few scattering areas of forested lands, while leaving the great body of such lands to be yearly swept by conflagrations, is clearly not to take care of our great reaches of forest lands in any adequate sense of the term."

"The immediate benefits resulting from the application of a forest service in the respective reserves has served in the nature of a demonstration of the importance of extending the service over all the forested lands of the government. It accordingly appears that

to longer continue merely withdrawing a body of land here and there and policing it, when all forested areas need to be withdrawn and protected, would be to close the eyes to the obvious fact that the system of establishing occasional reservations in widely scattered localities falls short of securing proper protection to our public forests. The legislation in 1891 authorizing the establishment of individual reserves has proved of inestimable value in affording this office a 'testing ground,' so to speak, in respect to the benefits of a forest service. A considerable expansion of that provision is, however, now needed to take in, as above shown, all forest lands of the government.

"To work upon narrower lines would be to reduce a so-called national system to serving, to a large extent, merely local purposes, at various points where bodies of land may be set apart as forest reservations. Under existing legislation the condition of affairs at this time presents the anomaly of the government setting apart certain isolated tracts of land and bestowing upon them rational protection while abandoning the great sweep of its forested area to waste and destruction from every source.

"Unchecked conflagrations and the inroads of lumbering companies are rapidly sweeping bare these unreserved lands, while, with full knowledge of the fact, this office stands powerless to check the evil.

"And, clearly, until the policy of withdrawing lands and placing them under a forest force is adopted, such must continue to be the case. Conflagrations which could be prevented or checked in their incipency by forest guards are now, in the main, given full sweep, while corporations and others have practically little or no limit placed upon their spoliation of public timber lands.

"The proved efficiency of a forest system in protecting and administering the reserves that have been set apart leaves no room to doubt the advisability of extending such a system as will protect all our forested lands."

The failure to do so heretofore has

resulted in the whole of the timbered portions of the public domain, and especially the portions lying west of the Mississippi River, being practically thrown open to pillage and to the far worse ravages of fire. To stay or check the tide of destruction there has been nothing beyond a petty force of special agents, averaging at present little more than fifty a year, with areas to protect scattered through a territory stretching over more than two-thirds of the entire country lying south of the British possessions. With such a force nothing can be attempted in anywise commensurate with the gigantic scale upon which the work of destruction has gone on—a work which, moreover, yearly increases in proportion to the rapid development of the country.

The inefficiency of this present system has been fairly tested for more than twenty-five years. During this time, had the three millions of dollars appropriated for the protection of these unreserved lands been expended in connection with establishing a forest service over the forested portions, incalculable benefit would have resulted, not only in connection with preventing unlawful destruction of the forests, but in furnishing required supplies of timber to meet the legitimate and growing needs of the country. For this timber the government would have received proper compensation, which would long since have made the work more than self-supporting. The timbered area of our public domain should undoubtedly be so administered as to be no longer a burden upon the revenues of the country. The timber itself is capable of producing a revenue far more than ample to cover all expenses connected with its care and management.

Undoubtedly, since the only rational course to pursue in connection with such of these lands as are more valuable for forest uses than for other purposes is to withdraw them from disposal, and to protect and administer them in accordance with the principles of forestry, no just reason can be adduced for delaying such action. Preservation of the forests, water conservation, the legitimate supplying of public needs in respect to

both timber and water, economy in regard to appropriations, increment of revenue—all alike would be subserved by a wise and enlightened administration of these lands.

The loss sustained by the government through its failure during the past century to enact reasonable legislation on this subject is appalling to contemplate. By fire alone the loss is beyond computation, while to this must be added the value of the timber otherwise swept from these lands in the interest of greed and speculation, for which no compensation has been returned to the government. Irreparable loss has been entailed upon the nation in respect to two of its most important natural resources—wood and water.

The interests of irrigation are vitally involved in this matter, for the forests must be preserved, if flood waters are to be stored. The entire undertaking hinges largely upon our treatment of these natural reservoirs. Let another quarter of a century follow of spoliation of public timber lands and unchecked forest fires, and the whole question of irrigation will assume a totally different character. The difficulties and the cost will both be multiplied an hundred fold. With 60,000,000 acres of arid lands thirsting for irrigation, the government can no longer afford to delay in the matter of preserving what remains of its natural reservoirs. The water problem in the west has settled the forest problem. It now simply remains for the government to act—and to act *immediately*, the lines of action having been clearly determined by its entering upon a national irrigation policy. Nothing short of the immediate withdrawal of all public lands that are more valuable for forest uses

than for other purposes, and proper provision for their protection, will meet the exigencies of the irrigation work. A bill to effect this purpose should undoubtedly be passed by the present Congress.

The fact that the American Association for the Advancement of Science is shortly to meet in this city presents the opportunity of securing for this movement the powerful support of that body. Such an opportunity should not be lost. The American Association for the Advancement of Science should therefore be asked to memorialize Congress for such legislation at this session; and it may be added that unremitting efforts should thereafter be put forth to see that the measure is not lost in Congress.

The admirable provisions of the bill on this subject recently recommended by the General Land Office seem to meet every requirement in the matter. It reads as follows:

"A BILL to withdraw and administer all public forest lands.

*"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That all public lands which are more valuable for forest uses than for other purposes, are hereby withdrawn from settlement, entry, sale, and other disposition, and shall be held for the protection and utilization of the timber thereon.

"SEC. 2. That the timber and other products of the lands hereby withdrawn from disposal shall be protected and utilized in accordance with the provisions of the laws relating to the subject of forest reservations in the state, territory, or district in which the land is situated."

## THE VISION OF IRRIGATION.

BY MINNA C. SMITH.

On brown and purple peaks against blue sky the snow,  
Fierce yellow sunlight on wide sage-gray lands.  
Clear, cold, and foaming white, swift Nile-green rivers flow  
That soon shall give this desert to men's hands.

*From the Outlook.*

# FOREST CONDITIONS IN SOUTHERN ARIZONA.

BY

ROYAL S. KELLOGG,

BUREAU OF FORESTRY.

THE person who travels across southern Arizona on the railroad is very likely to think that the whole region is nothing but a desert, with little present value and small hope for the future. He passes through an endless succession of sandy or gravelly valleys and slopes, interspersed with rocky ridges, all scatteringly covered with Yucca, Cactus, Mesquite, Creosote-bush and similar growths, which have triumphed in the struggle against arid conditions. Mountain ranges are always in sight, and they, too, look barren and forbidding, with little suggestion of beautiful forests and streams of clear, cold water which dash headlong down the canyons and over granite precipices, among stately pines, firs, and spruces. The timber resources of northern Arizona are well known; but in general only the residents of the southern portion of the territory are aware of the extent of the forest areas in the surrounding mountains.

Careful estimates show that the Huachuca Mountains have an area of 20,000 acres capable of sustaining coniferous forest; the Graham Mountains, 30,000 acres; the Chiricahua Mountains, 50,000 acres, while the Santa Catalina Mountains bring the total of the four ranges up to at least 140,000 acres.

The greatest elevations are from 9,000 to 10,000 feet, and good forest is not common below 7,000 feet, since it is only from that altitude upward that the precipitation is sufficient for the growth of valuable species. Soil conditions are good except in the sections that have been visited by fire. While no streams of permanent flow issue from any of these mountains, there are springs or small streams in all of them which frequently send water down to the line of the enclosing desert.

The Bull Pine (*Pinus ponderosa*) is the predominating tree throughout this region and furnishes nearly all the sawtimber. Conifers associated with it are: Arizona Pine (*Pinus Arizona*), Arizona White Pine (*Pinus strobiformis*),



A GOOD SPECIMEN OF BULL PINE, 48 INCHES IN DIAMETER, SANTA CATALINE MOUNTAINS, ALTITUDE 7,600.

Chihuahuan Pine (*Pinus chihuahuana*), Mexican Piñon (*Pinus cembroides*), Douglas Spruce (*Pseudotsuga taxifolia*), White Fir (*Abies concolor*), and Alligator Juniper (*Juniperus pachyphloea*); while on the high table-lands and slopes of the Graham Mountains all of these species





OPEN FOREST OF BULL PINE ON SUMMIT OF CHIRICAHUA MOUNTAINS, ARIZONA; ALTITUDE 9,000 FEET.



REPRODUCTION OF BULL PINE IN THE SANTA CATALINA MOUNTAINS; ALTITUDE 9,000 FEET.

are entirely replaced by a dense forest of Engelmann Spruce (*Picea Engelmanni*) and Alpine Fir (*Abies lasiocarpa*). The best development of the pine is always on northerly exposures; but the distribution is much more general in some regions than in others. The greatest amount of timber is in the Chiricahua Mountains, where the 50,000 acres of forest are estimated to average 5,000 feet, b. m., to the acre. On small areas in various places in these mountains the stand is much more dense. Mr. B. B. Riggs, who has a saw-mill at an elevation of 8,000 feet in Barfoot Park, estimates that in the immediate vicinity of the mill 400 acres of forest will yield 10,000 feet to the acre, which seems to be a safe estimate.

On one acre of mixed Bull Pine and Douglas Spruce, where the latter species predominates, 20 trees have been felled which average 36 inches across the stump and at least 1,000 board feet per tree. There are yet standing on this acre 35 trees averaging 25 inches in diameter, and 40 or 50 under 4 inches which were not measured. This is the best sample acre examined.

The rate of growth of the Bull Pine in southern Arizona is very rapid and practically the same in the various regions. The following ring counts were made on stumps at the Riggs Mill:

No. of stump.	Height stump.	Diameter.	Annual rings.
	<i>Inches.</i>	<i>Inches.</i>	
1 .....	30	33	167
2 .....	30	33	160
3 .....	28	32	160
4 .....	27	25	135
5 .....	33	30	145
6 .....	30	25	120
7 .....	30	21	100
8 .....	33	20	120
9 .....	32	23	118
10 .....	30	20	118
Average.....	30.3	26.2	134.8

This gives 5.1 rings per inch of diameter. The average growth for the first 30 years is about  $\frac{1}{3}$  inch in diameter per year. The maximum diameter attained is 48 to 50 inches, breast high.

The best tree seen had a length of 132 feet, and of this 84 feet was clear log. It was 42 inches across the stump, had 220 rings, and scaled 4,000 board feet.

While the Bull Pine is the principal source of local lumber supply, the quality is poor. It is knotty, rather brash, and often contains rotten streaks. There are many blind knots. On the first cut only one or two may be seen, while on the last there are often ten or fifteen. The lumber, however, is in much demand for mining and other purposes, as it can be delivered for \$25 per 1,000 feet at places where lumber shipped in costs \$60.

Here, as elsewhere, saw-mill men speak of two types of Bull Pine, and maintain stoutly that they are distinct species. The large, mature tree with characteristic plates of yellow bark is called "Yellow Pine," while the green, sappy tree with dark, ridgy bark is referred to as "Black Jack;" but instead of making new species it would seem better to classify the Arizona Pine as a form of Bull Pine. It grows with the latter, has bark of either the "Black Jack" or "Yellow Pine" type, its cones are commonly indistinguishable, and it is cut by mill men without discrimination. The needles of the Arizona Pine grow in bundles of five, according to the botanists, but there are many of four and some of six. On the other hand, the needles of the Bull Pine are far from being restricted to bundles of three. In a lot of 110 bundles on one twig were found 41 bundles of three needles each, 51 of four each, 14 of five each, and one of six. A lot of 183 bundles from another tree contained 114 bundles of three needles each, 64 of four each, and five of five.

The Rock Pine (*Pinus ponderosa scopulorum*) was not noted in southern Arizona, but grows farther north in the territory.

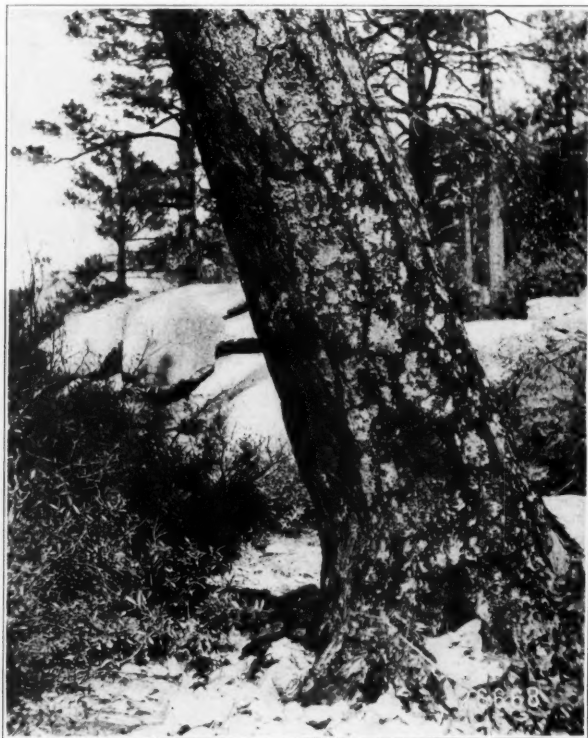
The reproduction of the Bull Pine is at present insufficient and unsatisfactory as a general thing. The best reproduction is in the Huachuca Mountains, where it compares quite favorably with that of the Pine Ridge country of Nebraska. On small areas are found

stands at the rate of 5,000 to 10,000 trees per acre, averaging five feet high, and reforestation is going on well when the course of nature is not disturbed. The reproduction in the Santa Catalina Mountains is fair, while in many places in the Chiricahuas and Grahams it is almost wholly lacking.

In striking contrast in these two regions is the young growth of Engelmann

sheep are rare and few cattle frequent the higher mountains. As the trees are not seeding this year, no tests of vitality were made. The possibility of forest extension hinges largely upon the ability of the forester to promote natural reproduction; and here is a profitable field for study.

Very little illegal cutting is being done at present. The Huachuca Moun-



SPECIMEN OF ARIZONA PINE IN SANTA CATALINA MOUNTAINS; ALTITUDE 6,000 FEET.

Spruce, which is abundant and thriving. The failure of the pine to reproduce well is probably due to a combination of several causes, which can be fully determined only by careful observation for a series of years. Apparently seed years are not frequent. The seasons are extremely variable, and have been very dry for a number of years past. Little damage has been done by stock, since

tain contains many more mining claims than the other regions mentioned, and are also within freighting distance of other large camps; consequently all the good timber was cut out years ago. The water for the town of Tombstone is furnished by reservoirs in two canyons in these mountains and is piped 25 miles. The supply is barely sufficient now, and its maintenance, of course, depends upon

forest conditions. The cutting in the famous "Copper Queen" case, which was decided recently in favor of the company, took place in the Chiricahua Mountains 7 to 12 years ago, and the cut-over area is completely skinned. Much of the available timber has been cut in the Graham Mountains, but more can be reached by road-building. The forest in the Santa Catalinas is nearly intact, because there are no good roads.

Repeated fires have swept over the Grahams and Huachucas, but they are less frequent now than in the days of Apache warfare, though still much too common. Insect pests are not dangerous, and only one tree was seen which seemed to have been killed outright by bark-borers. A parasite (*Phoradendron juniperum*) is sometimes found growing upon the Bull Pine, but is not serious. In some localities a species of *Arceuthobium* abounds, and the pine is quite badly infested with it.

The recent establishment of forest reserves in all of these regions except the Huachucas is an excellent move. While a conservative management of these reserves will not permit enough timber cutting to fully supply local needs, the timber that can be taken out will keep down to a reasonable figure the price of that which is brought in from other sources.



BLACK JACK TYPE OF THE BULL PINE.

## HUMANITARIAN ASPECT OF NATIONAL IRRIGATION.

EXTRACT FROM AN ADDRESS DELIVERED BEFORE THE DELEGATES TO THE TENTH NATIONAL IRRIGATION CONGRESS, AT COLORADO SPRINGS, COLO., OCTOBER 6-9, 1902.

BY

THOMAS F. WALSH,

PRESIDENT OF THE NATIONAL IRRIGATION ASSOCIATION.

THE inauguration of the national irrigation policy means a great deal to all our western states. It will add immensely to their wealth and population, and greatly broaden the

basis of their prosperity. It means even more to the nation as a whole. It opens the way to a new era of internal development and domestic expansion as great as any similar period of the past.

It is equivalent to the addition of a new empire as important as that drained by the Mississippi River and its tributaries. But these are not the considerations which are uppermost in my mind as I contemplate the results to flow from this new policy. It is what may be called the humanitarian aspect of national irrigation which quickens my pulse and makes me desire to dedicate myself anew to the work in which we are engaged.

The inauguration of national irrigation means that every family in the United States who wants a home upon the soil may have one. It means that the door is open to permit the man who is not needed where he is to go to the place where he is needed. It means the restoration of those automatic social conditions which in past generations relieved the pressure of population upon the old centers, and constantly extended the frontiers of civilization toward the north, south, and the west. When we read the history of the people of the United States in McMaster's pages, for instance, we are surprised to find at how early a date there was serious unrest because of the crowding of population and consequent depression of industry. Immediately after the close of the Revolution there was marked evidence of land hunger, and a fierce demand for more territory with which to feed the appetite for homes. It was then that the Ohio Valley received its first influx of settlers from the eastern states. So it was again after the close of the civil war, when the prairie states to the west of the Mississippi sprang into sudden existence, and when the tide of immigration flowed out upon the plains until it came within sight of the Rocky Mountains. We stand upon the threshold of another great colonization movement made possible by the glorious fact of national irrigation.

It is not, however, to broad movements of population that I especially desire to direct your attention. I am thinking rather of the family unit—of the father and mother and little children now confined within the narrow limitations of city life. I am thinking of how their horizon is to be broadened, and how their daily lives are to be en-

riched, by the transition from paved streets and crowded tenements out under the blue sky and into the sweet, pure air. It is not the dream of empire, which may come to a great nation with the conquest of a territory wherein a hundred million will some time dwell, which appeals to my imagination; but it is the dream of home and independence which will come to many a struggling family with the announcement that one more fair valley of arid America has been thrown open to settlement at the actual cost of reclamation. I picture to my mind the ambitious young man and woman just starting life and disheartened at the conditions offered them by the harsh competition of the town. I see the couple of middle age, with their children about them, wondering how they are to make provision for old age. I see the men of talent and ambition, some of them broadly trained in the trades and professions, who are yet unable to prosper in the midst of our changing economic conditions. These and many other classes I see living in hired houses and working at small wages for others more favored in ability or fortune. I know the pressure of poverty upon them, and the haunting fear of future want. Such people, and many of our best stock and breeding, are found all over the land, but especially in great cities, where the very forces which have created our present prosperity as a nation have also operated to make a certain fringe of half employed and semi-prosperous. And then I see national irrigation, like a good fairy, wave its magic wand, and lo! a new star of hope arises in the sky of our common humanity; a new vista opens before thousands of families; opportunity comes with beckoning finger. It points the way to a new Land of Promise. Hope chases anxiety from a thousand faces, and a new enthusiasm for home and independence drives apprehension from a thousand hearts.

This is to me the inspiring and uplifting aspect of national irrigation. True, we are to have millions of people living where few lived. We are to see a vast increase in national wealth. But all this is merely incidental to the hu-



man aspect of the matter, which is the making of homes for the homeless and the giving of social and industrial independence to those now dependent upon the enterprise of others. Let us take care of the family and the nation will take care of itself.

#### ATTRACTIONS OF RURAL LIFE FOR PEOPLE.

Let us look a little closer into this wonderful social process which is to be brought about by the new national policy. I think perhaps the time has come when something should be said about the attractions of rural life for the masses of our people. We have heard a great deal about the allurements of the towns and the manner in which they draw to them the cream of our young men and women. Living in the country has become unpopular. No body but old folks and foreigners can endure such an existence. Everybody else looks for a situation in the big city—and the bigger the better. It is undeniably true that the tide has been setting away from the soil, and that both here and abroad the cities have been rolling up to portentous proportions. Are there any signs of a reaction? I think there are. In the first place, country life is becoming fashionable again. The abandoned farms of New England have been largely bought up to be converted into the country estates of well-to-do city people. These city people are extending their vacations a little more each year. It is now almost customary for them to spend about six months on the farm. Simultaneously with this development we see a new literature springing up in response to it. There is no end of new books about birds, and flowers, and domestic animals. There are new periodicals which have quickly acquired large circulation because they deal attractively with this subject.

Now to my mind this new phase of our social life has a very deep significance. I hope and believe that it is not a mere fad or passing fashion. In my opinion, it is a manifestation of one of the strongest traits of human nature;

and that is man's inherent and ineradicable love for the soil. This is our natural taste, while the fascinations of town life are artificial. They do not satisfy our deeper feelings. Some one has said: "Religion is that fine sense of soul that brings the individual into touch with Universal Purpose." I have walked the streets of the finest cities in the world, but pavements and hotels and business blocks never touched that spring in my being which gave birth to a sentiment. On the other hand, I have climbed the rugged and picturesque sides of our great mountain ranges. I have stood upon the summits of some lofty peaks and beheld the beautiful panorama of snow-clad ranges, their mighty forms lifting far above the abodes of men and extending for miles in every direction. I have gazed at the sky and I have listened to the birds and to the roar of the mountain streams; and there, indeed, I have felt "that fine sense of soul which brings one into touch with Universal Purpose." Without attempting to elaborate the idea, I undertake to say that there is something in the heart of the dullest man who ever lived that responds to the beauties of nature. I firmly believe it is this instinct which is sending the well-to-do from the cities to the country, and which in the next few years will make the reclaimed areas of the arid west sought after by the very best elements of our middle class population.

#### BLAINE'S FAMOUS DEFINITION OF POVERTY.

James G. Blaine, in his eulogy of Garfield, referred to the fact that our second martyred President was popularly supposed to have been reared in direst poverty. The orator then went on to draw a contrast between the poverty of city life and the "clean, sweet poverty of the country." He showed that in the one case evil influences predominate, while in the other there is every inspiration to noble endeavor. This is absolutely true. It constitutes one of the very strongest arguments in favor of national irrigation. In how many biographies of successful men—of men who

have risen in politics, in business, in the professions, and in the arts—do we read the same familiar story of inspiration drawn from the strenuous experiences of a poor family reared in the country.

Now, the influences of rural life, to which Blaine referred in speaking of Garfield's boyhood, are going to be far more wholesome and far more inspiring in our mountain valleys and in this twentieth century than they were in the western reserve of Ohio in the first half of the nineteenth century. I cannot impress this point too strongly on your minds. The man who rears his sons and daughters in the rural life of our irrigation empire will give them a better chance to become useful men and women than boys and girls will have when raised in the city—a better chance, even, than young people enjoyed in the brave old days of which we read in the biographies of our great men.

Let me show you what I mean. The irrigated farm is necessarily a small farm. It must be so, because it is expensive to build and maintain reservoirs and canals. Not only so, but irrigation so largely increases the productive capacity so as to make 20 acres practically equal to 100 acres depending upon rainfall. The small farm means plenty of neighbors, and that in turn means social advantages which were not within reach of country people in the boyhood days of Garfield, Lincoln, and others of their generation. The boys and girls of arid America will have the intellectual stimulus which goes with neighborhood association. Thus they gain one of the chief advantages for which so many people are rushing into the towns. But this is only half of their advantage. The other half is the industrial independence and the glorious contact with nature which come with life on the irrigated farm.

The boys and girls who grow up in the great city learn from the beginning their dependence upon others. They must work for others as a means of livelihood, as their fathers are doing. They must live in houses which other men own. Why, mother cannot have a new sink in the kitchen without first petitioning the landlord and convincing

that august personage that the expenditure is really demanded in the interests of economy or comfort.

#### RURAL RESIDENTS WORK FOR THEMSELVES.

How different it is with that family when they acquire their part of the national heritage—a little irrigated farm in Colorado, in Idaho, in California, or any other of our beautiful western states. The soil which they press is their own soil. The roof that shelters them is their roof. Now father works for himself and for his babies. When mother needs a new sink in the kitchen there is nobody to ask except the man who loves her. This is freedom. What does it mean to the nation to have millions of people gradually pass from the servitude of the town to the sovereignty of the country? It means the enlistment of a new army for the defense of the Republic in every hour of need. Give a man a home upon the soil and you have made him a patriot who will defend your institutions at the ballot-box and on the battlefield.

I wish to impress clearly upon your minds that it is the humanitarian aspect of national irrigation which will move our countrymen and induce them to enter upon this policy on the grandest scale. Open the doors of the west and you need not worry about the future. Let the people have easy access to the land and most of our other troubles will settle themselves. The property-owner is a conservative man, who loves his family and his country. Then let the property-owner be as numerous as possible.

#### GROWING PREVALENCE OF GREAT PHILANTHROPIES.

There never has been a time in the history of the world when private benevolence was so common or so generous as it is today. Philanthropists are pouring out their means to build colleges, hospitals, and libraries. This is a worthy work, which we cannot too highly commend; but I want to avail myself of this opportunity to say that there is

no field where benevolence could accomplish so much as in assisting the reclamation and settlement of our great arid region. First, the propaganda which this Congress has carried on for many years might well be endowed with a fund which would enable us to increase the scope and efficiency of our work a hundredfold. Then we must doubtless devise a means by which the poorest families may be helped to get homes on the soil. Government land at actual cost does not wholly solve the problem. There are railroad fares to be met, homes to be built, lands to be improved, and mouths to be fed before the land comes into bearing. Thus the problem of colonization is by no means wholly solved by putting the water on the land. Foreign governments have dealt with this matter on humanitarian lines. Over eighty years ago, when the streets of Holland were filled with idle veterans returned from the Napoleonic wars, a wise Dutch general planned a series of labor colonies which absorbed all those who were willing to work. Those who did not care to work were chastised until they changed their minds or left the country. New Zealand has a plan by which the government acts as an employment agency, puts men at work in building public utilities, and finally deposits them on the land. I believe we shall soon be called upon to deal with this phase of our social question. Without attempting to suggest any definite plan, I merely throw out the hint that here is a fertile field for private benevolence. I do not see how a man could have a nobler monument than a colony of happy families, or even one family, enjoying the security and independence of life on the irrigated farm.

#### WHAT IRRIGATION HAS DONE FOR UTAH.

If you ask me for an example of what might be accomplished in this line

I point you to the irrigated valleys of Utah. These were settled by comparatively poor men, many of whom were assisted by a powerful organization. They live on small farms. They enjoy economic independence by the simple method of producing the variety of things which they consume. They live chiefly in villages, and so have social advantages not usually within reach of farming communities. It is an amazing statement, but the United States census vouches for its veracity, that of their twenty thousand farms nineteen thousand are wholly free of incumbrance. I love to think of those green oases among the Utah mountains. If dark hours shall ever come to the Republic, the dwellers in those lovely villages will know nothing of it except by mere hearsay.

They will continue to live on the fat of the land as long as water runs down hill. Working for themselves, owning their homes, and living in the midst of congenial neighbors, what have they to fear? Now think of arid America, with its hundred million acres of irrigable land, as densely populated as those Utah valleys; think of the people who combine the social advantages of town life with the industrial independence of the country; think of them with their daily newspapers, their telegraphs and telephones, and their rapid means of transportation for products and people; and then realize that under the plans we propose the humblest citizen of this great Republic can pass at will from the discouraging conditions of town life—if for him they happen to be discouraging—to the inspiring and hopeful opportunities of this new promised land.

It is when I think of the matter in this way that my enthusiasm is kindled until mind and heart are ablaze. I thank God that I have lived to see the great policy of national irrigation actually inaugurated.

# THE OSAGE ORANGE.

NOTES ON A TREE OF INCREASING ECONOMIC IMPORTANCE.

BY

WILLIAM L. HALL,

CHIEF OF DIVISION OF FOREST EXTENSION, BUREAU OF FORESTRY.

THE natural range of the Osage Orange (*Toxylon pomiferum*) is southern Arkansas, southeastern Indian Territory, eastern Texas, and northern Louisiana. It has been widely introduced elsewhere by cultivation. Its range for economic planting is in the south central states, from the northern boundaries of Kansas, Missouri, and Illinois south. The Osage Orange will grow on very sterile soil, but not thriftily. It prefers a deep, rich, clay loam, retentive of moisture.

The Osage Orange has been extensively used as a hedge plant in Iowa, Missouri, Illinois, and other prairie states, but it is frequently winter-killed near the northern limit of its cultivation. The wood is heavy, hard, elastic, and strong, and durable in contact with the soil. It is prized highly for use in cabinet-making and in the construction of carriages and machinery. It is a valuable post timber, and also makes excellent fuel.

The growth of the Osage Orange for the first few years is very rapid. It never makes a large tree, and matures in from 30 to 100 years. The tree when standing alone has a tendency to branch profusely. It is this habit which renders it of such great value as a hedge plant. If crowded, it can be made to grow into a form which adapts it for posts. The Osage Orange reproduces from suckers from the roots and from seeds, which are borne in great abundance by the pistillate individuals. The ripe fruit containing the seed is a fleshy, globular, yellow mass with a roughened surface somewhat resembling an orange. The fruit should be collected in the fall as soon as ripe, and should be stored in sand in a cool, dry place. In the early spring the fruit should be soaked in cold

water for several weeks until the tissues become somewhat macerated or decayed, allowing the seeds to be extracted. The seeds should be stratified as soon as removed from the fruits or else planted.

A good method of planting the seeds is in the bottom of a furrow made by a lister or a plow. They should be covered about an inch and a half deep. The seeds may be planted where the trees are intended to stand, or they may be planted in a nursery and the trees transplanted to their final site at the end of one year.

Common as the Osage Orange is as a hedge plant, its use as a timber tree has been infrequent. Solid blocks of it are scarcely ever seen, though it grows very successfully in this way, either when planted alone or with some taller-growing tree, as the Black Walnut, Locust, or Hardy Catalpa. At Manhattan, Kansas, the Agricultural College has a very successful block of it in mixture with Green Ash. Probably the largest single plantation of Osage Orange in the United States is a 10-acre block adjoining the large catalpa plantation of the Kansas City, Ft. Scott and Memphis Railroad at Farlington, Kansas. The trees in this block were planted in 1878, at a distance of 4 feet apart each way. In 1900, when a party from the Bureau of Forestry made a study of the catalpa plantation, it also made some measurements of the Osage Orange. No thinning had been done, and the dense growth was penetrated with extreme difficulty. The trees had made a perfectly thrifty growth, however, and measurements disclosed the fact that the stand contained 2,640 first-class and 2,772 second-class fence posts per acre, worth respectively 12½ and 7 cents each, showing an acreage



SCENE IN AN OSAJE ORANGE PLANTATION.

value of \$524.04. The land probably could not have been put to any other use that would have brought greater returns.

The Osage Orange reproduces from sprouts very readily. This quality allows the planter to take successive crops of posts from the same plantation for years. The young shoots grow up from the stump with such vigor that the second crop is more likely to consist

of straight, smooth post timber than the first.

The Osage Orange is a shade-enduring tree, and, as mentioned above, grows well when associated with other trees. The thorns of the tree make it often desirable to plant it in pure plantations, as in this way by thick planting it will better clean itself of side branches, and the need of tillage may be reduced to a minimum.

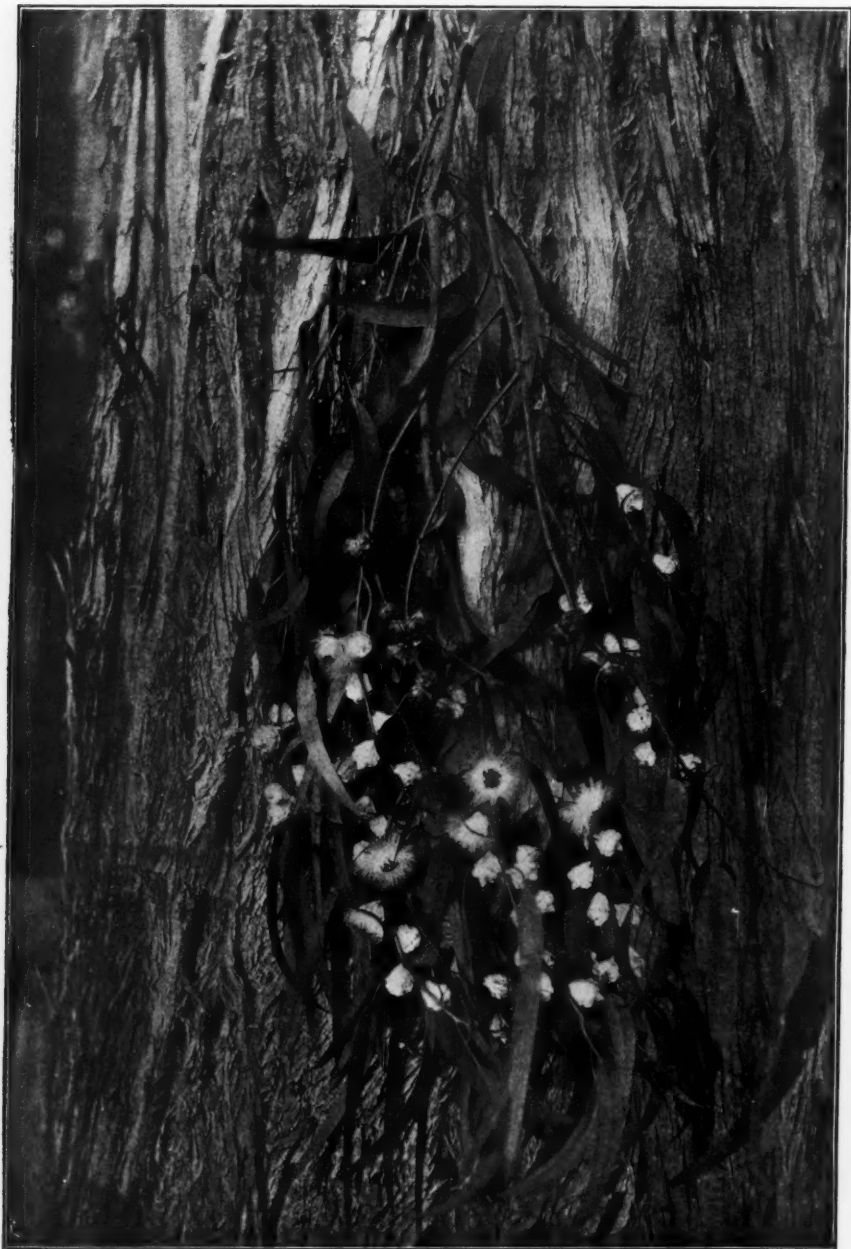
## THE EUCALYPTS.

A STUDY OF THE LEADING SPECIES OF THE MOST EXTENSIVELY CULTIVATED EXOTIC TREE IN THE UNITED STATES.

**T**HE Eucalypts, commonly known as the Blue or Red Gums in the southwestern part of the United

States, where they have been planted for forty years past, are discussed in a bulletin just issued by the Bureau of





BLUE GUM (*EUCALYPTUS GLOBULUS*) SHOWING BARK, LEAVES, AND FLOWERS.

Forestry under the title of "Eucalypts Cultivated in the United States." \*

Although of foreign origin, the Eucalypts seem specially fitted to the dry country of Arizona, New Mexico, southern California, and western Texas, where their value would be hard to overestimate. Their drought-resisting powers enable them to flourish where no large American tree will grow. They yield oil, gum, nectar for honey bees, furnish shade for the ranch-house, windbreaks for field crops, and firewood for localities where fuel is scarce; but their chief value lies in the possibilities they hold for the reforestation of the bare, dry mountain sides of the desert country and for the protection of irrigating streams. They are specially adapted for such purposes by reason of their rapidity of growth in arid soil. The Eucalypts are now grown in Ameriac, especially in the southwestern United States, more extensively than any other exotic forest tree.

No native American species can equal the extraordinary development of this exotic from remote Australia. On the ranch of Elwood Cooper, near Santa Barbara, California, there are Eucalypts 25 years old as great in girth as oaks of 300 years; and time and again the species known as Blue Gum has, when cut to the ground, sent up sprouts from the stump which in eight years have reached a height of one hundred feet; nor does this rapidity of growth shorten the life of the tree, for the Eucalypts, in their Australian home, reach a great age and rival in size the giant Redwoods and the Big Trees of California.

The author of the bulletin on "Eucalypts Cultivated in the United States," Prof. Alfred J. McClatchie, of the Arizona Experiment Station at Phoenix, has devoted ten years to the study of this genus. Besides his observations of its growth in the southwest, he has had the benefit of a correspondence concerning it with botanists of this country and of Australia, Algiers, and France.

\* Eucalypts Cultivated in the United States. By Alfred James McClatchie, M. A., Agriculturist and Horticulturist of the Arizona Experiment Station. Bulletin 35, Bureau of Forestry. Pp. 106, plates XCI.

The bulletin, while being devoted especially to the Eucalypts as they grow in this country, also contains short descriptions of their habits in their native home and of their remarkable travels into all the great dry regions of the globe.

Detailed descriptions are given of the best methods of propagating and caring for Eucalypts, which includes directions for germinating the seed, transferring the plants to forest soil, and setting them in the field. The bulletin contains, in addition, careful, detailed, descriptions, illustrated by photographs, of the principal Eucalypts cultivated in the United States.

Professor McClatchie has discussed the Eucalypts mainly from the standpoint of their usefulness, only incidentally treating them as ornamentals. No attempt is made to present an exhaustive botanical treatise of the Eucalypts. The botanical features introduced are intended to be subservient to the interests and purposes of the forester.

Only the large arboreal species are discussed—that is, species attaining a height of over 40 to 50 feet and a diameter of over 1 foot. Many of the species consisting of smaller trees are very interesting to the botanist and gardener, but they are of comparatively little interest to the forester.

The purpose of this bulletin is to give information concerning the characteristics of the Eucalypts, their climatic requirements, and their uses; to give directions and suggestions as to their propagation and culture; and to furnish a means of identifying seedlings and mature trees, so that as the Eucalypts growing throughout the southwest become identified, such trees may become sources of seed for propagation. This Australian group of trees now serves very many useful purposes in the southwest, and gives promise of great future usefulness in the semi-arid portions of our continent. It is believed that when the merits of these trees are fully understood, and information concerning their climatic requirements and their propagation is readily available, they will be planted more extensively and with increasing intelligence and dis-



VUE IN A GROVE OF 20-YEAR-OLD BLUE GUM; TREES 24 TO 28 INCHES IN DIAMETER.



EUCALYPTS AS FOREST COVER FOR PARKS, EAST LAKE PARK, LOS ANGELES, CALIFORNIA.

crimination. The covering of the now untillable, treeless portions of the semitropic section of America with such trees as Eucalypts, which will yield fuel, timber, and other useful products, and also furnish protection from the sun, from winds, and from floods, or otherwise ameliorate existing climatic conditions, is certainly an achievement greatly to be desired.

The illustrations, ninety-one in number, are from photographs made by the writer during the past six years. They add unusual value to the bulletin, giving an excellent idea of the bark, flowers, and seeds of the several species, as well as general views of groves and plantations. Several of the illustrations are reprinted here through the courtesy of the Bureau of Forestry.

## REPORTS BY SECRETARIES WILSON AND HITCHCOCK.

ANNUAL REVIEWS BY THE SECRETARIES OF AGRICULTURE AND INTERIOR WHICH SHOW GREAT PROGRESS IN FORESTRY, IRRIGATION, AND RELATED QUESTIONS.

### I.—FROM THE REPORT OF THE SECRETARY OF AGRICULTURE.

#### GROWTH OF WORK IN FORESTRY.

**I**NTEREST in forestry and a perception of its possibilities as a great national resource have developed so swiftly in the United States that the discrepancy between the capacity for government service of this branch of the department and its opportunities was never so great as now. During the past year the Bureau of Forestry has notably increased its store of knowledge on which all forestry depends, and has made large gains in introducing practical management of forests of both public and private ownership. Its field-work has engaged 162 men, and has been carried on in 42 states and territories.

Thirty-seven applications were received during the year, asking advice for the management of 200,000 acres. The total area now under management, in accordance with the working plans of the Bureau, is 372,463 acres. A working plan is in preparation for a tract in southeastern Texas comprising an area of one and one-fourth million acres, the largest private holding of timber land in the United States.

By the request of the Secretary of the Interior, the Bureau of Forestry has become his official adviser in matters of forest policy for the national forest reserves, covering over 60,000,000 acres.

Extensive studies were made of commercial trees during the year, and studies of the forest and its industrial relations were made in Michigan, Kentucky, Ohio, Texas, New Mexico, Arizona, South Dakota, Wyoming, Montana, California, and Iowa. Among the questions involved were the present and future timber supply, forest fires, relation of the forests to stream flow, irrigation, and grazing. The Bureau has discovered a less injurious method of turpentine orcharding than that hitherto employed.

In coöperation with the Bureau of Chemistry and in response to urgent demands, the series of tests to determine the strength of the principal merchantable timbers, discontinued in 1896, have been taken up.

In tree-planting the Bureau has sought to enlist the interest of the private landowner. Up to the close of the last fiscal year 262 applications for assistance had been received, nearly 200,000 acres ex-

amined, and 224 plans made. Not only does the example set by each plantation affect the neighborhood, but in many cases it has led to a public agitation of the question of tree-planting, and extensive planting on other land has frequently followed.

The Secretary enters an earnest plea for the establishment of the Appalachian Forest Reserve. He states that the water power, at an aggregate annual value of twenty million dollars, is being gradually destroyed through increasing irregularity in the flow; that the soils washed down from the mountain slopes are rendering annually less navigable the Ohio, Tennessee, and Mississippi and other rivers. These are the results of the deforestation of these mountain slopes. He states that the rate of land erosion on these slopes from which the forest cover has been removed is as great now in a single year as during ten centuries when covered with primeval forests.

#### SOILS SURVEYS.

Valuable work has been done by the Bureau of Soils. The methods devised for the analyses of soils in the field have been so perfected that the amounts of nitrates, phosphates, sulphates, and the like can be determined to within four or five pounds per acre, one foot deep.

An investigation was begun during the year as to the possibility of reclaiming soils in the arid regions injured by seepage water and the accumulation of alkali. Important work on this line is being carried out on a tract of 40 acres near Salt Lake City. Arrangements are being made to carry on simi-

lar work at Fresno, Cal., and it is proposed to extend it to the tropical area in Montana and possibly in Arizona, to demonstrate that these unfavorable conditions can be controlled. Land located in the immediate vicinity of Salt Lake City, he believes, can be increased in value by at least three millions of dollars, exclusive of the cost of reclamation, should it prove successful.

#### IRRIGATION.

The distribution and use of western rivers requires legislation on the irrigation industry, which, in turn, renders it necessary that there should be a better understanding of the subject than now exists. The department is securing information as to the quantity of water used, where it is used, how much water is required in the matter of crops, how it can be distributed with the least loss, and applied to the best advantage. Much has been done to educate farmers and ditch managers as to the direction in which improvement in the method of practice must come. They have made plans, have shown the need of better work in constructing and maintaining canals, and have shown that the loss of water through leakage in transit is far greater than is generally supposed.

Through the courtesy of government officials in Egypt the representative of the department was enabled to become fully acquainted with the administration of laws governing the use of the Nile. Allowing for differences in conditions, the lesson of one of the oldest irrigated countries in the world cannot fail to be of interest and value to one of the youngest.

## II.—FROM THE REPORT OF THE SECRETARY OF THE INTERIOR.

On the day following the passage of the law for the reclamation of arid lands at the last session of Congress plans were submitted by the Director of the Geological Survey for putting it into effect; and these being approved by the Secretary, survey parties were at once put in the field to obtain all of the facts

concerning the feasibility of various projects.

Great care is being exercised in selecting projects which will be of the greatest benefit to the country; which will settle upon the land the greatest number of people, and which will return to the Treasury the cost of the



undertaking, keeping intact the fund for new works. No consideration of expediency or sentiment can be tolerated, but only those making the working a success from a business standpoint.

#### SALE OF PUBLIC LANDS.

The report shows that there were disposed of during the fiscal year public lands aggregating 19,488,535 acres, an increase of 3,925,739 acres as compared with the aggregate disposals for the preceding fiscal year.

Total cash receipts during the fiscal year, from various sources, including disposal of public land, \$5,880,088.65, aggregate \$6,261,927.18, an increase of \$1,289,766.39.

The total area of the public lands is approximately 1,809,539,840 acres, of which 893,955,476 acres are undisposed of.

#### GRAZING INTERESTS' MENACE.

The avowed policy of the government to preserve the public domain for homes for actual settlers has no more implacable and relentless foe than the class that seeks to occupy the public lands for grazing purposes by maintaining unlawful fences thereon.

The fight between this class and the government has been going on for years, and resulted in the passage of the act of February 25, 1885, which provides for the institution of civil proceedings for the removal of such fences and criminal prosecution of the trespassers, and authorizes the President, if necessary, to call on the civil and military authorities to remove such unlawful inclosures; but, notwithstanding the passage of said act and the efforts of this department to enforce it, the abuse has continued, and the beneficiaries thereof have grown so bold and arrogant that they practically defy the efforts of the department and the government to execute the law.

There is now pending before Congress a bill entitled "A bill to provide for the leasing, for grazing purposes, of the vacant public domain, and reserving all rights of homestead and mineral entry,

the rentals to be a special fund for irrigation." Should that bill become a law, the public domain in the sixteen states and territories mentioned therein, aggregating an area of 525,000,000 acres, practically all of the vacant public domain west of the Mississippi, would be subject to lease at two cents per acre for ten years, with the privilege of renewal for ten years more. It is needless to say that such a bill, if enacted into law, would place the last acre of desirable public land out of the reach of the homeseeker and defeat the purpose of the government to preserve the public domain for homes for actual settlers.

It would also defeat the operations of the reclamation act and make possible the formation of a land monopoly never contemplated by the public-land system, but which, on the contrary, it is one of the purposes of that system to prevent.

#### MINERAL LOCATION PRETENSE.

Another method resorted to by unscrupulous speculators to obtain timber upon the unreserved timber lands, and to which the attention of the department has been called by its special agents, is the location of so-called mining claims under placer mining laws. Quite a number of such claims have been located in fine bodies of timber in a number of western states. So far as the records of the Land Department show, the lands are unappropriated public lands, and there is nothing to call the department's attention to them, and it would never know of these locations unless reported by a special agent or if the locator should apply for a patent. Assuming the land to be really mineral, so long as the locator does the annual assessment-work required by law he will be entitled to the main possession of the tract embraced in his mineral location. If it be made for purposes of speculation only and for purposes of acquiring timber within the limits of the location, the only way by which the government can reach him will be by careful investigation of the character of the land upon which the location is made, and if, after such investigation, it be determined that

the land is not mineral in character, and that the location is made for speculative purposes, to arrest the locator as soon as he begins to cut timber. The only defense he can make will be to show that the land is mineral in character, and that he is cutting timber to develop his claim as allowed by law. Should he fail in that, he will have to pay the penalty.

#### THE FOREST RESERVES.

New forest reservations have been established during the year, the forestry service extended, a better and more thorough system of patrolling the reservations has been perfected, and the work of reforestation on the various reservations has been entered upon with satisfactory results. There are now fifty-four forest reserves, embracing

60,175,765 acres. During the last fiscal year four existing reserves have been enlarged, four have been reduced, and fifteen additional have been established.

The adequate protection of the forest reserves and the extension thereof to other public timber lands as occasion arises must necessarily go hand in hand with the operations looking toward the reclamation of the arid lands of the west.

Timber on the unreserved public lands cannot now be properly protected; existing laws relating thereto, and especially the act of June 3, 1878, known as "The timber and stone act," if not repealed or radically amended, will result ultimately in the complete destruction of the timber on the unappropriated and unreserved public lands. The situation demands the passage of remedial legislation.

## THE HARDY CATALPA.

INTERESTING STUDY OF A VALUABLE TIMBER TREE.  
RATE OF GROWTH—COST OF PLANTING—PROFIT IN  
RAISING CATALPA—IMPORTANT CULTURAL POINTS.

"THE Hardy Catalpa," a bulletin just published, is a valuable addition to the series of studies of American commercial trees which the Bureau of Forestry has undertaken. The value of this publication will be greatest in the middle west, where the Catalpa has been planted for many years with varying success, and where even now it is imperfectly understood. The farmer of the prairie states who desires to put a part of his lands into Catalpa, either for profit in selling posts and ties, or to supply his farm with timber, will find in the bulletin valuable information clearly and simply given.

The bulletin is in two parts. Wm. L. Hall, Superintendent of Tree Planting, discusses "The Hardy Catalpa in Commercial Plantations," while Dr. Herman von Schrenk, of the Bureau of Plant Industry, writes of "The Diseases of the Hardy Catalpa." Mr. Hall gives the results of careful studies of the Munger, Farlington, Hunnewell, and Yaggy plantations, all in Kansas. The

most important facts developed by him are as follows:

It is much cheaper for the planter to grow his trees from seed than to buy them from a nursery, if a large number are to be planted. In the Munger plantation the cost of trees grown on the farm was 50 cents per thousand, while those from a nursery, with freight, cost about \$4 per thousand. The cost of establishing the Yaggy plantation with home-grown trees, including cutting back and two years' tillage, was \$11.70 per acre; the cost of establishing the Farlington forest by contract, including the same amount of tillage, but no cutting back, was \$30 per acre.

Some idea of the profits in growing Catalpa for the market may be gained from the results achieved on the four plantations described in this bulletin.

On the Munger plantation the present value is equal to a net annual acreage return of \$15.01 from the time of planting, thirteen years ago. The Farlington Forest and the Hunnewell planta-

tion respectively show a net annual return of \$12.65 and \$14.78 per acre from the time of planting. The Yaggy plantation shows a net return of \$7.25 to \$21.55 per acre, depending on the fertility of the soil in various parts of the plantation.

From these figures it will be seen that the growing of Catalpa brings fully as great returns as are to be realized from any agricultural crop in the same region.

Hardy Catalpa makes its best growth on very rich, deep soil. In the Farlington forest the returns on the best soil are almost five times as great as on the poorest.

Grown in pure stand, the Catalpa should be protected from the wind by shelter belts of taller trees. A thin belt of Cottonwood on the windward side of a plantation will protect the edge trees and allow them to make much taller and straighter growth; even an Osage



A 20-YEAR-OLD PLANTATION OF HARDY CATALPA IN SOUTHERN IOWA.

Orange hedge, though not growing so tall, will generally protect them.

The proper spacing used in planting is from 4 by 4 to 4 by 6 feet. The Catalpa planter who sets his trees thinly upon the ground will find them growing with spreading tops in spite of his most careful efforts to prevent it. The most important advantage of close planting for

The development of large side branches unfits the Catalpa for practical use. While the stand may become so dense as finally to shade them out, they cling with such persistence to the growing trunk that it cannot cast them off. New wood is deposited around the dead branches, but does not unite with them. The holes thus formed lead straight



SECTION SHOWING THE PROPORTION OF HEARTWOOD, SAPWOOD, AND BARK ON A 20-YEAR-OLD CATALPA TREE (REDUCED FROM 9½ INCHES).

the Catalpa is that it kills the lateral branches while young. If the lateral branches die before becoming more than one-half inch in diameter, they are easily pushed off by the tree and do no damage; but if they reach a larger size than this, as they are sure to do in thin planting, they cling to the tree for years, even after they die.

into the heart of the tree, and the angle of the branches is just right to conduct water and germs of decay into the trunk. When the branch is finally released, it leaves a great hole leading to the decayed heart of the tree. The tree thus ruined sooner or later breaks down—a complete loss.

Cutting back the young trees after

two or three seasons, so as to develop a single sprout from the stump, greatly hastens height-growth and prevents low side branches.

With close planting and cutting back two years afterward, thinning will become necessary within eight or ten years from the time of planting. Some of the trees will be large enough for fence posts, and if the work is judiciously done good returns may be secured from this first cutting.

When the first growth is bushy and undesirable a better growth can usually be secured by cutting the stand clean and reproducing it by sprouts.

A clean-cut stand should be protected by occasional strips of timber left uncut for the protection of the succeeding crop of sprouts. This is especially necessary on the prairies where heavy winds prevail, for the young sprouts are very tender and easily broken off during the first year or two of their growth. The protective strips are best run east and west, as the most damaging winds are from the south.

The best growth of Catalpa is not obtained in pure plantations. This statement is contrary to general practice and belief, for almost all Catalpa plantations throughout the country are pure

planted. The advantage of a suitable associate tree is that by shading the ground it will keep out weeds and grasses and kill off the lateral branches of the Catalpa, thus giving the tree a straight, clean bole to the height of 18 to 20 feet. The best trees for planting with Catalpa in the middle west are Osage Orange and Russian Mulberry.

Growers need not hesitate to force the growth of their Catalpas, as the wood is apparently just as good when grown fast as slow. The rate of growth makes no difference in the sale of the product. Only shape and size count.

Dr. von Schrenk finds that Catalpa wood, if cut from the living tree, is one of the most durable timbers known. No fungus has yet been found that will grow in the dead wood. The wood of living trees is attacked by two fungi, one causing a soft rot, the other a brown rot. Dr. von Schrenk discusses these two diseases and recommends methods of preventing them.

The bulletin is handsomely printed, and the many excellent half-tone plates add much value to the text. The accompanying illustrations are taken from the bulletin, and are reprinted here through the courtesy of the Bureau of Forestry.

## RECENT PUBLICATIONS.

**The Woodsman's Handbook, Part I.** By HENRY SOLON GRAVES. Bulletin 36, Bureau of Forestry, U. S. Department of Agriculture. Pp. 148.

"The Woodsman's Handbook," the first volume of which has just been issued by the Bureau of Forestry, will be of great value to lumbermen and foresters alike. Its author, Mr. Henry S. Graves, director of the Yale Forest School, has endeavored to collect all the rules in use in this country and Canada for finding the contents of standing timber and of logs 12, 16, and 20 feet in length, of diameters from 6 to 60 inches. He has compared them in a series of tables and described their origin and mode of use. The Scribner, Doyle, and New Hampshire rules are printed in full; the rest appear in part in the comparison tables. Descriptions are given of the methods of estimating standing timber in use by timber cruisers in different parts of the country, and of the method adopted by the Bureau of Forestry. The Handbook contains also an out-

line for a forest working plan and descriptions of instruments of use to the woodsman.

The second volume of the Handbook, which is to be published soon, will contain detailed directions for the study of age and growth of trees, including diameter, height, and volume growth. A most valuable feature will be a compilation of the tables of growth, yield tables, and volume tables for all the trees that have been systematically studied in this country. The defects, strength, durability, and fuel value of timber, the amount of tannin in bark, specifications and weights of logs, and weights of lumber will be discussed. In addition, the second volume will contain compound interest tables, tables for converting metric to English measure, and areas of circles.

The Handbook is of a size convenient for carrying in the pocket, and is attractively bound in green leatherette. It may be obtained only through the Senate, the House of Representatives, or the Department of Agriculture.



**Annual Report of the Commissioner of the General Land Office.** For the fiscal year ending June 30, 1902. Describing the work of the Division of Forest Reserves. Department of the Interior. Pp. 120.

The report of the General Land Office on the work of the Division of Forest Reserves is of unusual interest this year as showing that already appreciable benefit has resulted from the reorganization of that division in November last, by placing it under the charge of a trained forester, with several forest experts, having both technical and practical experience to assist in developing the work.

The forest working force has been re-arranged, placing the forest supervisors in direct charge of their respective reserves, making the duties of the forest superintendents those of local inspectors, and grading the ranger force into three classes, under the titles of assistant supervisors, rangers, and guards.

The present arrangement avoids considerable friction, and leads to greater dispatch in disposing of business.

Much benefit is shown to have resulted from the first effort at inaugurating an established system of timber sales in one of the reserves, namely, the Black Hills Forest Reserve in South Dakota, where the revenue derived from furnishing timber supplies to meet local demands has been double the expense connected with the work. Such a result emphasizes the advisability of extending the system to all of our forested lands.

Special stress is laid upon the need for the immediate withdrawal of all public lands which are of more value for forest uses than for other purposes. This is recommended not only with a view to preserving the timber supply, but in the interest of irrigation. It is pointed out that the recent passage by Congress of the bill inaugurating an irrigation policy may, in its effect, be regarded as amounting, indirectly, to legislation broadening our national forest work. To insure effective operation of that law it is necessary that the forest growth upon all watersheds throughout the public domain, in the states and territories affected, should be preserved as an integral part of the work of water conservation.

The establishment of reserves for this purpose marks a third phase of the work already reached in the development of our forest system; the work, as now in hand, extending to the care of existing forests, reforestation of denuded areas, and afforesting treeless regions.

It is shown that during the year five of the existing forest reserves were enlarged, the areas of four were reduced, and fifteen additional reserves were established. Extensive temporary withdrawals of lands were made in a number of other cases, in which the advisability of establishing reserves is still under consideration.

The most gratifying showing in the report is probably the efficiency of the work of the forest force, evidenced in the large number of fires reported as having been discovered

and extinguished, the decrease in the area burned over, and the reduction in the expense incurred in fighting fires. While forest fires have been unusually destructive to both life and property in a number of states during the past season, owing to unprecedented drouth, the forest reserves in the same regions have been kept comparatively free from serious fires. As a result, the people in those communities have become convinced that government control of the forests means protection from fires. This fact has led to numbers of petitions being submitted from various quarters urging the establishment of forest reserves.

#### **Field Operations of the Bureau of Soils (1901).**

Third Report, by MILTON WHITNEY, Chief of the Bureau of Soils, U. S. Department of Agriculture. Pp. 647. Illustrated and accompanied by a portfolio of Maps. Published by the Department.

This report is of particular interest on account of its record of the relation of the alkali and irrigation problems, and its general recommendations on soil reclamation by the use of irrigation and drainage. In the reports of the soil investigations of the tobacco lands of the Eastern and Southern States general plant investigations have been made to supplement the soil surveys, with advice as to soil management, growths, etc. Probably the most spectacular and successful experiment ever attempted by the Department of Agriculture was undertaken and carried through by the Tobacco Investigations Division of this Bureau under Mr. M. L. Floyd, who has left the employ of the Government to take charge of the shade-grown tobacco industry in Connecticut for a private corporation.

But to those interested in irrigation and soil reclamation the most important part of the report is that devoted to the western soil surveys and particularly to those of California. Here the questions of sub and surface irrigation and drainage are fully gone into and the recommendations made should be of the utmost value to farmers in that region and to those who contemplate taking up irrigated lands. **FORESTRY AND IRRIGATION** will publish later full résumés of the field operations of value to the magazine's readers.

#### **Canadian Forestry Association. Report of the Third Annual Meeting.** Pp. 128. Illustrated by 17 half-tones from drawings and photographs. Ottawa: Government Printing Bureau.

In addition to the record of the meeting of the association which was held last March at Ottawa, this report contains many interesting papers, those of a popular nature being on the Canadian forest fires of 1901, the planting of trees on the great treeless prairies of Manitoba, Assiniboia, and Alberta provinces, and the æsthetic and economic value of tree planting about residences in those regions.

## PUBLISHER'S NOTES.

A recent number of *Printer's Ink*, the authority on advertising matters, had the following to say about this magazine: "Of the six monthlies devoted to forestry and irrigation but one gets credit for issuing regularly so many as 3,000 copies. It is FORESTRY AND IRRIGATION."

In the last issue of the American Newspaper Directory FORESTRY AND IRRIGATION was credited with an average monthly circulation of 5,650 copies for a year ending August 1, 1902. During the succeeding months the circulation has been growing rapidly and 8,000 copies were printed this month to meet the demand. At the present rate of increase the circulation will be 10,000 copies a month before the end of 1903.

Advertisers who wish to reach substantial people will do well to consider the foregoing statements.

We note with regret that the December issue of *Meehan's Monthly* is to be the last of this valuable publication. This magazine has for almost twelve years past been a leader in presenting valuable matter concerning the higher branches of horticulture and general gardening. *Meehan's Monthly* has undoubtedly created in many sections of the country a love for the beauties of nature. It has done much to bring about a desire for the improvement of gardens and grounds in suburban and country homes, and its suspension is a distinct loss to the field in which it labored.

A number of new advertisements appear in this issue of FORESTRY AND IRRIGATION, to which we respectfully call the attention of our readers. This magazine is becoming a more valuable advertising medium with each number, and this fact is being appreciated more and more by firms who are anxious to bring their business to the notice of substantial people.

It is our desire to increase the advertising patronage of this magazine as rapidly as possible, but no advertisements of a questionable nature will be accepted.

The Marble Axe Co., of Gladstone, Mich., whose advertisement appears in this issue, are the manufacturers of numerous implements of convenience for campers, hunters, and lumbermen. Readers of FORESTRY AND IRRIGATION who need such implements should write for their catalogue.

The publisher of FORESTRY AND IRRIGATION will be glad to get the names of persons interested in the subjects to which this magazine is devoted. No doubt many of our readers know such persons, and if they will kindly send us their names we will take pleasure in mailing them sample copies of this magazine.

## LAUGHLIN FOUNTAIN PEN

The Best at Any Price

Sent on approval to  
responsible people.

A Pocket Companion of  
never ending usefulness, a  
source of constant pleasure  
and comfort.

To test the merits of  
Forestry and Irrigation  
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we offer your choice of  
these popular styles super-  
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**\$3.00**

grades of other makes for  
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Unconditionally Guaranteed  
Pre-eminently Satisfactory.

Try it a week, if not suited,  
we buy it back, and give you  
\$1.10 for it (the additional ten  
cents is to pay for your trouble  
in returning the pen). We are  
willing to take chances on you  
wanting to sell; we know pen  
values—you will when you  
have one of these.

Finest quality hard Para rubber  
reservoir holder, 14k. Dia-  
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desired flexibility in fine, med-  
ium or stub, and the only per-  
fect ink feed known to the sci-  
ence of fountain pen making.

Sent postpaid on receipt of \$1.00  
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This great Special Offer is  
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Remember—There is No  
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Insist on it; take no  
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State whether Ladies' or  
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Illustrations are full size of  
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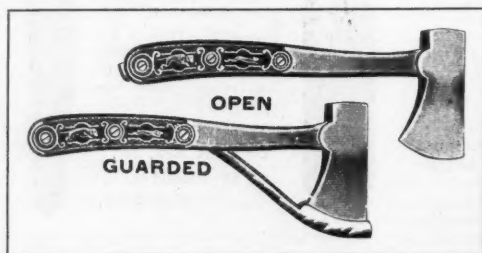
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Manager for Central Eastern Department

**715 Fourteenth St. N. W.**

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**Marble's  
Safety Pocket  
Axe**

**WILL INTEREST YOU**

Send for circular describing it together with numerous conveniences for campers and hunters.

**MARBLE SAFETY AXE CO.**

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FOR

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Our nurseries are known the world over as headquarters for Forest Tree Seeds and Seedlings and nearly every Foreign Government is supplied by us. We have a large acreage of one and two year seedlings especially grown for Forestry purposes

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INCORPORATED

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Below competition for first-class trees: Catalpa Speciosa, 2 1/2 to 4 ft., \$5 per M; Linden, 6 to 12 in., \$1.35 per M; Sugar Maple, 1 to 3 ft., \$2.50 per M; American Linden, 1 to 2 ft., \$3.50 per M; Butternut, 1 to 2 1/2 ft., \$3.50 per M; Red Cedar, 5 to 12 in., \$2.75 per M; Hazel Nut, 1 to 3 ft., \$1.50 per M; White Birch, 1 to 3 ft., \$3.50 per M; Tulip Poplar, 1 to 3 ft., \$3.50 per M; Magnolia Acuminata, 1 to 3 ft., \$3.75 per M.

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New Book . . All about Nuts  
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## We Grow Them

Good, Well Rooted

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And a general assortment of all other nursery stock. WE SELL THEM direct to planters, and you save 25 to 50 per cent agents' commission. Send for our PLANTERS' PRICE LIST and Catalogue.

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## MILLIONS...

Of Forest Tree Seedlings grown each season. . . Also Apple and Pear Seedlings and a complete General Nursery Stock. . . Write for our Catalogue, Free.

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See their full-page advertisement in this issue . . .

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### Tree Seedlings in Large and Small Lots

**Catalpas, Russian Mulberry,  
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indefinite ornamental varieties**

Would like to correspond with any one who could supply good fresh tree and shrub seeds this fall.

that sell nursery stock from the famous

whose stock is better adapted to all localities than any others. Agents wanted in every county. Write at once for terms and territory, giving reference.

We now have the finest and most complete line of nursery stock ever grown in Arkansas. If you, Mr. Planter, are interested in fine fruit at a small outlay of cash, then send for our catalogue. It tells you all about the fine things we have.

Write to-day to —

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and Scientific American.....	3	50
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Make out a list of what papers you want and let us submit prices.

We will be pleased to name you a very low rate. *Magazine Readers' Guide* will be mailed free. We also have several tons of nice, clean sample copies of Illustrated, Story, Agricultural, Literary, etc.—in fact, all sorts, classes, and kinds of papers and magazines. We will send these, postpaid, one pound, 10 cents; three pounds, 25 cents.

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SHOULD CONSULT



Our 96-page  
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We are the Oldest Agency in existence.

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Any one in Class C may be added to any of the above combinations by adding..... \$0.25

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Everybody's Magazine, the Arena, and Cosmopolitan.....	2.50

Forestry and Irrigation and a new subscription to Special Crops, a 75c. monthly magazine, devoted to ginseng culture, may both be added to any combination above by adding \$1.00, which is the price of Forestry and Irrigation alone.

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The double track is now completed between Chicago and Council Bluffs. Four fast trains each way daily between Chicago and Omaha, three trains daily to the Pacific Coast and two to Denver.

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**S. K. HOOPER, G. P. & T. A.  
... DENVER, COLORADO ...**



Scene in Eagle River Canyon along Denver & Rio Grande R. R.

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ORGANIZED APRIL, 1882.

INCORPORATED JANUARY, 1897.

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WASHINGTON, D. C.

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Very truly yours,

Name.....

P. O. Address.....

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The Northern Cheyennes are now located on a reservation in the valleys of the Tongue and Rosebud rivers in Montana, not far south from the **Northern Pacific Railway**

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